

## DEPARTMENT OF THE ARMY SUPPLY BULLETIN

### Army Medical Department Supply Information

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#### **Special Notice**

This Supply Bulletin is Dedicated Entirely To The  
**Maintenance Engineering and Operations Information**

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**CHAPTER 1. MEDICAL MAINTENANCE GENERAL INFORMATION**

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**1-1. CALIBRATION AND REPAIR OF AUDIOMETRIC EQUIPMENT**

a. For several years, the Medical Maintenance Operations Division, Tobyhanna PA (MMOD-PA) has been providing calibration and repair of audiometric equipment utilizing the postal system as a means of transit. Although it was a major change for everyone involved, it now appears that the program is both viable and economical. The turn-around time for repair and return services is averaging three working days in-house, with monthly completion rates nearing 100%.

b. We are constantly working to reduce our turn-around time. To accomplish this we need your help. Please don't wait until the calibration date expires before sending us your equipment for servicing. Staggering your shipments through the month(s) that the calibration is due allows for a much more orderly and productive workflow. This division's goal is to provide the best possible service to our customers.

**1-2. CUSTOMER ASSISTANCE**

a. Since we are dedicated to providing the best quality work and the most efficient service to our customers, the USAMMA Maintenance Engineering and Operations Directorate (MEOD) has established a Customer Assistance Program for the Medical Maintenance Operations Divisions.

b. After your equipment has been repaired and returned to your unit, we would appreciate you taking a few minutes to complete and return the questionnaire that will be enclosed with the equipment. You may also complete this questionnaire on our website at <http://www.usamma.army.mil/maintenance/comments/index.cfm>.

c. If you have questions concerning this program call the MEOD at DSN 343-4378 or commercial 301-619-4378.

**1-3. DENTAL HANDPIECES**

a. The USAMMA MEOD has re-established the Dental Handpiece-Rebuild Program at the MMOD-PA. We currently service the following models:

- Mid West, XGT
- Mid West, Shorty 1 and 2 Speed (Slow Speed)
- Mid West, Tradition (High Speed)
- Mid West, 8000 I
- Mid West, Proply Angle
- Mid West, Nose Cone
- Mid West, Quiet Air
- Star, 430
- Star, Titan/Scaler
- Impact Air 45
- Lares 557-757
- Kavo 635
- Kavo 642

b. These handpieces were selected due to their high densities and based on the current capabilities within the MMOD-PA. If you would like us to consider other models, please contact us at DSN 795-7744 or commercial 570-895-7744. Please note that we are attempting to reduce the turn-around time for all of the services that we offer. When handpieces are sent in lots of ten or smaller, our goal is to return them within 72 hours. Large lots will take longer to return.

#### **1-4. DEPOT-LEVEL MAINTENANCE SERVICES AVAILABILITY LIST**

a. These lists of medical equipment are updated periodically to inform customers of available maintenance services. The medical equipment items supported by the MMODs are listed below and can be sent for all depot-level services.

b. Prior to sending any other nonstandard medical equipment please contact the applicable maintenance activity to ensure that the items can be supported. Shipping instructions for each of the medical maintenance operations are included in the external standing operating procedures (SOPs).

c. For additional information or clarification call the USAMMA MEOD at DSN 343-4378 or commercial 301-619-4378.

#### TOBYHANNA PA

<u><b>MICROSCOPES</b></u>	<u><b>PHOROPTERS</b></u>	<u><b>LENSOMETERS</b></u>
Nikon – Labophot 1 & 2	Marco RT300	Marco 101
Olympus – BH & U	Leica 11625	Leica 21 65 70
All Cambridge	All American Optical	
All Leica	All Bausch & Lomb	
All AO		
All Bausch & Lomb		
<u><b>SLIT LAMP</b></u>	<u><b>KERATOMETER</b></u>	<u><b>VISION TESTER</b></u>
TOPCON – SL30 & SL6E	Leica 71 21 35	AFVT 2300
<u><b>AUDIOMETERS</b></u>		
All Tracor/Tremetrics		
All Maico		
All Beltone		
Grason-Stadler – GSI10, 16, 27, 27A, 28, 33 and 38		
<u><b>DENTAL HANDPIECES</b></u>		
Impact Air 45		
Kavo 635		
Kavo 642		

<b><u>MICROSCOPES</u></b>	<b><u>PHOROPTERS</u></b>	<b><u>LENSOMETERS</u></b>
Lares 557-757		
Mid West, XGT		
Mid West, Shorty 1 and 2 Speed (Slow Speed)		
Mid West, Tradition (High Speed)		
Mid West, Shorty Nose Cone (Fits on Shorty 2 Speed)		
Mid West, Prophy Angle		
Mid West, Quiet Air		
Mid West, 8000 I		
Star, 430		
Star, Titan Scaler		

TRACY CA

<b>NOMENCLATURE</b>	<b>MODEL NUMBER</b>
Shelter Expandable which include	
Continental, VP-4s, and CTs	
X-Ray Apparatus Field Dental	D3152/Siemens
X-Ray Film Processing Machine	AFP14X-3MIL/AFP
Collimator, Over Table	70-40001/Trex
Collimator, Under Table	70-40004/Trex
Spot Film Device	CS-8952/Trex
X-Ray Porta-ray	1200/Dynarad
X-Ray Processing Machine	Curix60/Agfa
X-Ray Apparatus Dental	Alpha MPDX/Dynarad
X-Ray Apparatus Radiographic	Clinix VP-4/Picker
<b><u>TUBEHEADS</u></b>	
X-Ray Tubes	B100/Varian
	Sapphire 150 <sup>th</sup> /Varian
	Emerald/Varian
	Diamond 150 <sup>th</sup> /Varian
	PX-1312C/Dunlee
	PX-1301C/Dunlee



<b>NOMENCLATURE</b>	<b>MODEL NUMBER</b>
(continued) X-Ray Tubes	PX-1302CQ/Dunlee
	PX-1351C/Dunlee
	PX-1352C/Dunlee
	PX-1402CQ/Dunlee
	PX-1402EQ/Dunlee
	PX-1412CS/Dunlee
	PX-1412CQ/Dunlee
	PX-1436CQ/Dunlee
	PX-1436EQ/Dunlee
	PX-1436ES/Dunlee
	PX-1429EQ/Dunlee
	PX-1482AQ/Dunlee
	Maxi Ray-75/General Electric
	Maxi Ray-75R/General Electric
	Maxi Ray-75AMX/General Electric
	Maxi Ray-75FLXR/General Electric
	Maxi Ray-76 18NR/General Electric
	Maxi Ray-100/General Electric
	Maxi Ray-100 18NR/General Electric
	Maxi Ray-100 FLXR/General Electric
	BI-150/Siemens
	350-10/Phillips
	500541/1200/Dynarad
<b>TMDE EQUIPMENT</b>	
Meter X-Ray Calibration Multimeter Radiographic, w/mAs Meter X-ray Calibration & Verification System	UNFORS, 710-L PMX-III; 07-472 07-457; 07-472; 07-473
Gas Flow Analyzer Calibrator Gas Flow	VT-Plus RT-200
Anesthetic Gas Analyzer	Riken 1802D
CO2 Analyzer	2820
Analyzer NIBP	Cufflink
IV Pump Analyzer	IPT-1
Defibrillator Analyzer TPA	Impulse 4000

NOMENCLATURE	MODEL NUMBER
Tester Defibrillator	DT2000A
Densitometer, SU150/P	07-423
Simulator, Medical Function Calibrator Generator, ECG	215M ECG 100
Computer, Laptop	Various
Foot Candle Meter	9-118
Oscilloscope, Digital	THS720P
Wattmeter, Ultrasound Therapy	UW-4 UMR 3-C UMR 3-D
Simulator, Pulse Oximetry	INDEX 2M <sub>FE</sub> Cardiosat EF
Test Cassette, X-Ray	07-467
Test Set, Electrosurgical	454A RF302
Tester, Current Leakage	232M
Tester, Ventilator	Pneuvue 36000I

#### HILL AFB UT

All TO&E equipment except x-ray and optical
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### **1-5. EQUIPMENT DIRECT EXCHANGE PROGRAM FOR MEPS**

The MMOD-PA provides an equipment direct exchange program for the Military Entrance Processing Stations (MEPS). When a piece of equipment fails, the MEPS call MMOD-PA for an exchange replacement. The replacement equipment is sent out immediately to the requesting unit. The unit then sends their broken equipment to MMOD-PA for repair and placement back into the exchange program. This process alleviates the need for any direct MEDDAC/MEDCEN involvement. Below is a listing of equipment in the direct exchange program.

NSN	NOMENCLATURE	MODEL	MFR
6515-01-305-1161	Audiometer	RA400	Tracor, Inc.
6515-01-C19-0018	Bio-Acoustic Simulator	BA-201	Quest Electronics
6525-01-142-1094	Camera, ID Radiographic	X-1	Eastman Kodak
6525-01-268-5152	Camera, ID Radiographic	2	Eastman Kodak
6640-01-141-0798	Centrifuge, Lab	225	Fisher Scientific
6640-01-432-0443	Centrifuge, Lab	C412	Jouan, Inc.

NSN	NOMENCLATURE	MODEL	MFR
6640-01-C03-0004	Centrifuge, Lab	708T	Drucker, Co.
6640-01-C03-0005	Centrifuge Table Top	Centra CL4	International Equip Co.
6635-01-064-5791	Densitometer	301	X-Rite, Inc.
6635-01-411-1859	Densitometer	331	X-Rite, Inc.
6515-01-430-3523	Electrocardiograph	Elite II	Burdick Corp.
6540-00-299-8587	Lantern Color Perc. Tester	Farnsworth	Macbeth Division
6540-00-181-8037	Lens Measuring Instr.	12603	Cambridge Instr.
6540-00-299-8134	Lens Measuring Instr.	21-65-70	Bausch & Lomb
6540-01-417-7951	Lens Measuring Instr.	101	Marco Equipment
6540-01-C12-0001	Lens Measuring Instr.	EL-7S	Cambridge Instr.
6650-01-207-0829	Microscope Binocular	Labophot	Nikon, Inc.
6650-01-325-3747	Microscope Optical	Various	American Optical
6525-01-428-1509	Mixer, Chemistry X-Ray	CADI	Picker, Inc.
6525-01-C13-0006	Mixer, Chemical	100-J	Eastman Kodak
6515-01-416-1966	Monitor, Vital Signs	Vitalmax 800	Pace Tech, Inc.
6540-01-432-1910	Refractor, Automatic Eye	1200M	Marco Equipment
6540-01-432-1912	Refractor, Automatic Eye	595	Humphrey Instr.
6540-01-C18-0003	Refractor, Automatic Eye	ARK-760A	Marco Equipment
6525-01-C19-0001	Sensitometer	303	X-Rite, Inc.
6525-01-413-1163	Sensitometer	334	X-Rite, Inc.
6540-01-375-9031	Vision Tester, Stereoscope	2300	Stereo Optical Co.

## 1-6. MAIL AND FREIGHT ADDRESSES

The addresses for sending mail and freight to the Medical Maintenance Operations Divisions are listed below:

### Medical Maintenance Operations Division, Utah (MMOD-UT)

MAIL	FREIGHT
U.S. Army Medical Materiel Agency	U.S. Army Medical Materiel Agency
Medical Maintenance Operations Division	6149 Wardleigh Road
ATTN: MCMR-MMM-DU	Building 1160, Bay 1
6149 Wardleigh Road	Hill Air Force Base UT 84056-5848
Building 1160	
Hill Air Force Base UT 84056-5848	
DSN 586-4947, commercial 801-586-4947	
FAX: DSN 586-5058, commercial 801-586-5058	

**Medical Maintenance Support Division, Utah**

MAIL	FREIGHT
U.S. Army Medical Materiel Agency	U.S. Army Medical Materiel Agency
Medical Maintenance Support Division	6149 Wardleigh Road
ATTN: MCMR-MMM-SU	Building 1160, Bay 1
6149 Wardleigh Road	Hill Air Force Base UT 84056-5848
Building 1160	
Hill Air Force Base UT 84056-5848	
DSN 586-4949, commercial 801-586-4949	
FAX: DSN 586-5063, commercial 801-586-5063	

**Medical Maintenance Operations Division, Pennsylvania (MMOD-PA)**

MAIL	FREIGHT
U.S. Army Medical Materiel Agency	U.S. Army Medical Materiel Agency
Medical Maintenance Operations Division	Medical Maintenance Operations Division
ATTN: MCMR-MMM-DP	Warehouse 4, Bay 1
Tobyhanna Army Depot	Tobyhanna Army Depot
11 Hap Arnold Boulevard	Tobyhanna PA 18466-5063
Tobyhanna PA 18466-5063	
DSN 795-7744, commercial 570-895-7744	
FAX: DSN 795-7699, commercial 570-895-7699	

**Medical Maintenance Operations Division, California (MMOD-CA)**

MAIL	FREIGHT
U.S. Army Medical Materiel Agency	U.S. Army Medical Materiel Agency
Medical Maintenance Operations Division	Medical Maintenance Operations Division
ATTN: MCMR-MMM-DC	Building T-255, Tracy Site
Building T-255, Tracy Site	25600 Chrisman Road
Defense Distribution Center	Defense Distribution Center
P.O. Box 960001	Tracy CA 95376-5050
Stockton CA 95296-0970	
DSN 462-4556, commercial 209-839-4556	
FAX: DSN 462-4563, commercial 209-839-4563	

**1-7. MAINTENANCE SUPPORT FOR TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE)**

a. TMDE are those devices used to evaluate the operational condition of an end item or system, or identify/isolate any malfunction. TMDE-Special Purpose (TMDE-SP) are those devices which are unique to the Army Medical Department (AMEDD). TMDE-General Purpose (TMDE-GP) are common TMDE used throughout the Army.

b. In accordance with AR 750-43, Army Test, Measurement, and Diagnostic Equipment Program, each unit that uses TMDE will designate a TMDE coordinator in writing. The coordinator will act as a central point of contact for TMDE calibration and repair support (C&RS) matters concerning the unit's TMDE. The coordinator will be responsible and have

authority for monitoring the unit's TMDE management program. This program will be consistent with:

*AR 750-43, Army Test, Measurement, and Diagnostic Equipment Program;*  
*AR 750-1, Army Materiel Maintenance Policy & Retail Maintenance Operations;*  
*DA Pam 738-750, Functional Users Manual for TAMMS; and*  
*TB 750-25, Maintenance of Supplies and Equipment Army TMDE C&RS Program.*

c. The TMDE support coordinator will coordinate with the MMOD-CA for maintenance and calibration services of TMDE-SP. The DODAAC for MMOD-CA is W62SEV. For repair and service, TMDE-SP will be shipped to the following freight address:

U.S. Army Medical Materiel Agency  
Medical Maintenance Operations Division  
Building T255, Tracy Site  
25600 Chrisman Road  
Defense Distribution Center  
Tracy CA 95376-5050

d. The TMDE-SP items shipped must be accompanied by a DA Form 2407, Maintenance Request completed as specified in accordance with TB 38-750-2, Maintenance Management Procedures for Medical Equipment. All TMDE shipped will include appropriate accessories.

e. The TMDE support coordinator will coordinate with the local Area TMDE Support Team (ATST) or Area Calibration Laboratory (ACL) to provide maintenance and service of TMDE-GP. In the event there is not an ATST or ACL available within the geographical location, coordination may be made with the MMOD-CA to provide maintenance and calibration services of TMDE-GP.

## **1-8. REPAIR PARTS SUPPORT**

a. Many of the repair parts in TO&E medical units are no longer available from the original manufacturer and are being sold by alternate vendors with different part numbers. Accordingly, some technicians are having difficulty identifying and ordering repair parts for their medical equipment. To help alleviate this problem, the Medical Maintenance Support Division, Utah is establishing a centralized class VIII repair parts program.

b. This program may have significant advantages to you.

(1) It eliminates your research time. You identify the part number you need and the equipment it belongs to and give us a call. Through this program we develop a centralized database which cross-references part numbers. This means that when vendors go out of business or change part numbers, we do the research for you.

(2) When manufacturers have minimum quantity orders or minimum dollar levels orders, we will absorb the items or quantities that you don't need. You only pay for the item or items that you want.

(3) Some manufacturers stop supporting medical equipment with little or no notice. This leaves a time lag between the supportability of existing equipment and the procurement of new equipment. We will bridge this gap by maintaining a parts inventory for each of these items.

(4) It will aid in the identification of high-mortality parts that should become part of a unit's class VIII PLL at deployment.

c. The Medical Maintenance Support Division-Hill AFB currently has a supply of some repair parts and has the capability to provide overnight shipping for emergencies. For those parts that we do not stock, we will pass the requisition to the vendor with instructions to ship the parts directly to you. Repair parts are not free to any customer and the Medical Maintenance Support Division, Utah must be reimbursed for the actual costs of the parts that you order.

d. For information on this program or to order parts, please call at DSN 586-4950 or commercial 801-586-4950 or fax your requests to DSN 586-5063 or commercial 801-586-5063.

### **1-9. STANDING OPERATING PROCEDURES (SOP) FOR DEPOT-LEVEL SERVICES**

In an effort to provide current information, the external SOPs for the three MMODs have been updated. The SOPs are located in appendix A for MMOD-PA, appendix B for MMOD-CA, and appendix C for MMOD-UT. The SOPs include services provided, points of contact, and procedures for requesting services. If you require a service that is not listed, please contact a MMOD for coordination and assistance. Please do not send them equipment without prior coordination. The SOPs are also posted on our website at <http://www.usamma.army.mil/maintenance/>

### **1-10. TMDE BATTERIES**

The MMOD-CA requests that you remove the 9-volt battery(s) in TMDE when it is not in use. They are receiving much of the TMDE with corrosion damage because old batteries were left inside.

### **1-11. TURN-IN OF EQUIPMENT**

All units turning in equipment to the USAMMA MMODs need to be aware that the divisions will not sign a DA Form 3161 acknowledging ownership. They will however, sign a DD Form 1348-1 acknowledging receipt and return a signed copy of this form to your organization to clear your property book.

### **1-12. UNIT TURN-INS**

a. If you have excess equipment, non-repairable items, or just plain "junk" at your unit, please turn it in at your local DRMO. The senior maintenance person can authenticate all turn-in documentation as stated in TB MED 750-1.

b. Turning in these equipment items locally will save the unit and the USAMMA Maintenance Divisions time and the unit will save transportation costs.

c. If you think USAMMA might need your equipment items for our Cannibalization Point, please contact the USAMMA Maintenance Division nearest you, or contact the USAMMA MEOD at DSN 343-7441 or commercial 301-619-7441.

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**CHAPTER 2. MEDICAL MAINTENANCE OPERATIONS INFORMATION**

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**2-1. 754M VENTILATOR, 6530-01-464-0267, IMPACT INSTRUMENTATION**

a. There is a recent upgrade in calibration software. The new version is compatible for Windows 2000 software. The old Win 98 version will not communicate with laptops with Windows 2000 or NT software. The USAMMA is currently resolving the issue and Windows 2000 compatible software will be available for maintenance personnel soon. You may also contact Impact directly for a copy of the software at 800-969-0750.

b. There has also been a change in the output checkout procedures in the tidal volume accuracy section. The 100ml at .2 seconds has been removed from the procedures. The new parameter is 200ml at .4 seconds with a breath rate of 50 bpm. The checkout procedure can be found in D. The steps are also found on the MEOD web page at <http://www.usamma.army.mil/maintenance/754.pdf>.

c. Recently, personnel from the USAMMA traveled to the Middle East region and discovered that many ventilators are leaking internally around a black seal at the compressor inlet barb. If you are experiencing this problem, a quick fix is to put a zip tie around the seal to secure it in place. Be sure that you clean the inlet filter at the compressor intake circuit and clean the outlet filter to prevent inaccurate readings or outputs.

**2-2. ALARIS IV PUMP, 6515-01-486-4310, MEDSYSTEM III**

When replacing the motor in this unit, make sure to run the new motor prior to installation, for 24 hours using a DC power supply with no load. After installing the new motor in the unit there are a few tests in the literature that need to be performed. Refer to the service manual to perform these tests (section 7.0, 7.1 and 7.3). A test kit will need to be purchased for section 7.3 tests (mechanical subsystems, the gauge block kit, part #2861164). Failure to do these tests can result in incorrect flows and volume delivered. The telephone number for Alaris Parts and Technical Support is 800-854-7128.

**2-3. AUTOMATIC EXTERNAL DEFIBRILLATOR (AED), 6515-NS**

a. Technical data sheets for the AED indicate that there are no manufacturer's scheduled services other than the operator pushing some test buttons on the AED. The literature does state that a "qualified technical professional" can test the AED energy delivery. Using the defibrillator analyzer that has capability to produce a trigger signal that causes the AED to discharge, the AED energy output can be checked and verified.

b. Until further notice, MEDCOM's position is that the AED needs to be scheduled for periodic verification of the calibration.

c. Since the AED provides only one output power level (250 joules), using the DA Label 175 to certify the output power level is considered redundant. Therefore, use only the DD Form 2163 label to document the verification.

**2-4. CALIBRATOR/ANALYZER (TIMETER, MODEL RT-200), 6695-01-255-2855**

The current calibrator/analyser (Timer, model RT-200, 6695-01-255-2855) fielded to Army TOE units is not capable of calibrating the model 754, Impact ventilator, 6530-01-464-0267. To perform calibration on a 754 ventilator, the RT-200 requires a modification that provides an RS232 port and the associated electronics. The unmodified RT-200 can be used to validate calibration. Medical treatment facilities with the 754 ventilator should use the instructions listed at Appendix D to validate calibration. If the ventilators fail any part of this validation procedure or otherwise require services, the ventilators should be sent to your supporting MMOD for complete service. In the meantime, the USAMMA is working aggressively to identify and procure TMDE that can adequately calibrate the Impact 754 ventilator.

**2-5. CONTINENTAL X-RAY, 6525-01-312-6411**

a. It has frequently been observed that when a 100 KW field generator is powering the system, the line voltage does not reach the required operating setting. By re-taping the autotransformer, the incoming line voltage is increased to a sufficient amount.

b. These are the modifications and upgrades that are routinely performed on the Continental R/F mobile x-ray system by the USAMMA MMOD-CA. When the line set modification is performed, a set of instructions indicating what was done is added to the calibration paperwork. The medical maintenance section should maintain this paperwork.

c. If you are experiencing line voltage deficiencies and your x-ray apparatus has not received the modification, follow this procedure. These changes will allow approximately 17 more volts as an output to compensate for lower incoming line voltage.

KVP SELECTOR CHANGES
1. Remove wire labeled A-13 from KVP major selector position 1. This wire will not be used. Insulate wire end with tape and heat shrink.
2. Remove wire labeled A-12 from KVP major selector terminal 2. Connect wire A-12 to KVP major selector terminal 1 (where A-13 was removed).
3. Remove wire labeled A-11 from KVP major selector terminal 3. Connect wire A-11 to KVP major selector terminal 2 (where A-12 was removed).
4. Remove wire labeled A-10 from KVP major selector terminal 4. Connect wire A-10 to KVP major selector terminal 3 (where A-11 was removed).
5. Remove wire labeled A-09 from KVP major selector terminal 5. Connect wire A-09 to KVP major selector terminal 4 (where A-10 was removed).
6. Remove wire labeled A-08 from KVP major selector terminal 6. Connect wire A-08 to KVP major selector terminal 5 (where A-09 was removed).
7. Remove wire labeled A-07 from KVP major selector terminal 7. Connect wire A-07 to KVP major selector terminal 6 (where A-08 was removed).
NOTES: <ul style="list-style-type: none"> <li>- Wire labeled AL (to the Fluoro Variac) must remain on KVP major selector terminal 1.</li> <li>- Wire labeled AH (to the Fluoro Variac) must remain on KVP major selector terminal 8.</li> <li>- There is now no wire connected to KVP major selector terminal 7 (where A-07 was connected). A jumper must be installed from terminal 7 on the major KVP selector to terminal 6 (behind wire labeled A-6) on the coarse line adjust switch. This should be an 8-gauge insulated braided wire.</li> </ul>



COARSE LINE ADJUST SELECTOR MODIFICATIONS
1. Remove the wire behind wire labeled A-2 on the line coarse adjust switch terminal 2. Connect removed wire behind wire labeled A-1 on the coarse line adjust switch terminal 1.
2. Remove the wire behind wire labeled A-3 on the line coarse adjust switch terminal 3. Connect removed wire behind wire labeled A-2 on the coarse line adjust switch terminal 2.
3. Remove the wire behind wire labeled A-4 on the line coarse adjust switch terminal 4. Connect removed wire behind wire labeled A-3 on the coarse line adjust switch terminal 3.
4. Remove the wire behind wire labeled A-5 on the line coarse adjust switch terminal 5. Connect removed wire behind wire labeled A-4 on the coarse line adjust switch terminal 4.
5. Remove the wire behind wire labeled A-6 on the line coarse adjust switch terminal 6. Connect removed wire behind wire labeled A-5 on the coarse line adjust switch terminal 5.
NOTES
After removing the wire behind wire labeled A-6 on the coarse line adjust switch terminal 6 the jumper wire from terminal 7 on the major KVP selector to terminal 6 of the coarse line adjust switch can be installed.

## **2-6. DEFIBRILLATOR TESTER, DT2000A, 6625-00-433-9063**

The following instructions for cleaning the defibrillator tester were provided by the MMOD-CA:

- a. Use a soft cloth, dampened in warm, soapy water. Wring out excess water to cleanse unit and paddle surfaces.
- b. Do not use any petroleum distillate-based products, solvents or harsh abrasives on these surfaces (i.e. carbon cleaner, acetone).
- c. The defibrillator paddle surfaces should be kept clean and free of conductive gel.

## **2-7. DENTAL X-RAY APPARATUS, MODEL ALPHA, 6525-01-370-7551**

- a. A problem with the alpha MPDX case lid has been identified. The dental chair is mounted underneath the lid during storage, which puts undue stress on the integrity of the case. Many times this results in the spacer/chair lock being pulled through the lid.
- b. The solution to this problem is to brace the lid with a metal plate at the location where the spacer/chair lock is attached. The metal plate must cover enough area to be effective. We have been centering the spacer/chair lock on a 2-¼ x 10-inch aluminum support plate. When installing the plate, use RTV silicone compound, NSN 8030-00-145-0118, to maintain a proper case seal. Lock nuts may be used to fasten the plate to the lid.
- c. Questions should be directed to the MMOD-CA at DSN 462-4558 or commercial 209-839-4558.

## **2-8. EXPEDITIONARY DEPLOYABLE OXYGEN DISTRIBUTION SYSTEM (E-DOCS), 6530-01-505-0526, GAUGE DAMAGE**

a. Damage may occur to the vacuum gauge PI-13 (P/N 581480-009, 78.13, Pacific Consolidated Industries) located at the back of the EDOCS unit. Damage occurs when there is a positive pressure greater than 10 psi on the cylinder fill circuit while the vacuum/fill switch valve V6 is switched to vacuum. In order to prevent this from happening follow these procedures.

- (1) Close V6 vacuum/fill valve
- (2) Close V4 backup cylinder shutoff valve
- (3) Open V7 cylinder fill valve
- (4) Vent all cylinders to atmosphere, leave them open and connect to fill circuit
- (5) Ensure backup cylinder shutoff valve V4 is closed before attempting to draw vacuum
- (6) Check PI-12 gauge, make sure it is at 0 psi. If not at zero, crack one of the cylinder adapter valves to bleed pressure.
- (7) At this time it is safe to start the vacuum pump and switch the vacuum/fill valve to vacuum.

b. Never switch V6 to vacuum if there is any pressure on V6 vacuum/fill valve. This will instantly blow the gauge. Remember there is an oxygen pressure potential of 2250 psi on V6 and the gauge will be damaged at less than 10 psi. A slight crack of the valve when it has high pressure will mean a new gauge will be needed.

c. Order Vacuum Gauge (PI-13) using P/N 581480-009, \$78.13, Pacific Consolidated Industries (714) 979-9200 ext 251.

d. If you have any questions contact MMOD-UT at DSN 586-5045 or 801-586-5045.

## **2-9. E-DOCS, 6530-01-505-0526, LEAKS**

a. The E-DOCS may experience leaks at the union of the pigtail and yolk adapter. This is caused by the difference between the straight threads of the pigtail and the tapered threads of the yolk adapter. Currently the threads on the yolk adapter are only engaging less than an eighth of an inch into the pigtail.

b. To correct this, retie the threads on the yolk adapter. To accomplish this, take a ¼ pipe die and reverse it so that the smallest end cuts first. Retool all the way to base of adapter, clean and reapply Teflon thread tape. This reduces the taper and allows the adapter threads to engage further into the pigtail. After changing the taper threads to straight threads on the yolk adapter, the sealing surface area more than doubles, eliminating any leaks.

## **2-10. GENERAL MAINTENANCE OF THE I-7802 IMAGE INTENSIFIER SYSTEM**

a. The image intensifier system provided with the Continental x-ray apparatus (CS-8952) with NSN 6525-01-312-6411 requires very little maintenance. However, the cleaning of the outer lens and viewing mirror, and the periodic "seasoning" of the intensifier tube, are essential to the system operating at its optimum level.

b. The manufacturer recommends that the painted metal portions of the intensifier system be wiped with a damp cloth and the lens and viewing mirror cleaned with lens tissue and lens cleaning solution every thirty days.

c. "Seasoning" is accomplished by applying the electrical current to the tube for a period of twenty-four hours. If the tube has been installed, power can be applied through the spot-film device. If the tube is stored, power can be applied by using the auxiliary power cord and any 120V outlet. If stored, season the tube every six months.

d. Any questions regarding the image intensifier system or the Continental x-ray apparatus may be addressed to the MMOD-CA at DSN 462-4556 or commercial 209-839-4556.

## **2-11. I-STAT, 6630-01-411-2568**

The I-STAT software is updated every three to six months, so it is recommended that units calibrate or update the analyzer as needed. This update is not a depot-level responsibility; it is the responsibility of the unit-level maintainer or the operator to ensure that the proper updates are installed. Updates are free to all end users that have the analyzer. Simply call the company to get on their software mailing list: I-STAT Corp. 800-366-8020.

## **2-12. NARKOMED INSTALLATION GUIDE**

Appendix E contains guidance for installing the Narkomed-M Anesthesia Apparatus into the two-sided expandable tactical shelter.

If you have questions call MMOD-UT at DSN 586-4948 or commercial 801-586-4948.

## **2-13. OHMEDA OXYGEN MONITOR, 6515-01-279-6450**

The oxygen sensor, part number 0237-2034-700, which costs \$144.00 has a maximum shelf-life of 12 months. Your replacement/acquisition plan should consider the shelf-life.

## **2-14. OPERATING TABLE, HOSPITAL, MODEL 2080, 6530-01-353-9883**

a. The operating table, manufactured by Steris Corporation, LIN T00029, is supplied with a number of accessory components. The list of accessories supplied with the operating table (listed below) is taken from the Medical Procurement Item Description (MPID).

b. For ease of inventory and operational readiness, you should make a copy of this table, laminate it in plastic, and include it with the operator and service documentation.

Part Number	Item Description
18688-091	Holder (pair)
77033-091	Ether Screen Assembly
77035-091	Lateral Braces (pair)
77036-091	Wrist Holder Assembly (pair)
77040-091	Lithotomy Legholders (pair)
83594-001	Pads (listed below)
P093074-001	Pad, Foot Section
P093075-001	Pad, Back Section
P093076-001	Pad, Head Section
129357-096	X-ray Top Sections (4 each) Section 1 – Head Section 2 – Back Section 3 – Seat Section 4 – Leg
P056397-500 (Old Number) P150830-168 (New Number)	3" Arm Board Pad
56130-001	I.V. Arm Board Without Pad
B146645-277	62" Image Intensifier Board
No Part Number	Clark Sockets (4 each)

c. For more information on parts, write Steris Corporation at 2424 W. 23<sup>rd</sup> Street, Erie PA 16506, or call 800-333-8828.

## **2-15. PARTS SUPPORT FOR LIFECARE<sup>®</sup> PLV-102 PATIENT, VENTILATORS WITH NSN 6530-01-324-4514 AND 6530-01-324-4515**

a. These self-contained, battery operated, patient ventilators acquired during Desert Storm may still be in use throughout the Army Medical Department (AMEDD), and in particular the Table of Organization and Equipment (TO&E) environment.



PLV-102

b. A recent call for parts support information on LIFECARE® products disclosed that parts and service are available from Respironics at the following address:

Respironics  
1501 Ardmore Boulevard  
Pittsburgh, Pennsylvania 15221-4401  
Telephone: 412-731-2100  
1-800-638-8208 (US and Canada)  
Fax: 412-473-5010

c. The web address for Respironics is **<http://www.respironics.com/>**.

d. If you have a requirement to support the LIFECARE® PLV series of ventilators at your activity, you should contact Respironics Customer Service at 800-345-6443. They will provide you with the name of a local representative, or create an account so you can order parts.

## **2-16. PICKER VP-4 X-RAY APPARATUS, NSN 6525-01-384-9296**

a. During repair and rebuilding of the VP-4 we have noticed that several of the units have developed cuts in the insulation material of the high-voltage cables. The back brake PCB cover plate causes this during lifting and lowering of the tube stand for use and shipment.

(1) To remedy this problem, install protective channeling around the cable port opening of the cover plate. If channeling is not available, try using some surgical tubing or similar type tubing. Slit tubing along its length and apply a small amount of RTV to secure it to the sharp edge of the cover plate.

(2) This simple fix can help to reduce down time and avoid the replacement of the high-voltage cables.

b. For those VP-4s that are losing the collimator calibration once you turn off the power, there is a new set of chips soon to be available at the MMOD-CA. These new chips should correct the problem. The part number for the chip set is 380072.

c. If you have any questions on the collimator calibration or obtaining the chip set, please call MMOD-CA at DSN 462-4557 or commercial 209-839-4557.

## **2-17. POGS 33 (PORTABLE OXYGEN GENERATION SYSTEM), 6515-01-505-0203**

a. To ensure proper electrical phasing to the unit, open the compressor, apply power and ensure the belt is moving in the right direction. There is a marking for the direction of movement of the belt inside the unit. If the belt is not turning in the correct direction, turn the unit off and switch one of the cables for the incoming power.

b. Ensure there is suction at the intake filters and not blowing air through the filters.

c. When calibrating the O2 monitor at 20.9 purity concentration (normal room concentration) and the unit does not reach O2 purity, try calibrating unit to pure oxygen

(±99.8) concentration first, then recalibrate low point (20.9%). This will set the high and low concentration points.

d. When calibrating the unit for O<sub>2</sub> purity, you will always need to induce a flow of 20 lpm.

e. The compressor lid has a custom made "G" shaped clip to keep lid stand from swinging down when closing the lid. This will prevent the lid stand from breaking.

f. Due to a high concentration of oxygen, rust may develop in the yoke assembly of the POGS unit. There is no need to be concerned – the first tank in the unit is a filter. Any rust on the surfaces can be cleaned with a wire brush and compressed air.

**2-18. PROTOCOL SYSTEMS INC./WELCH ALLYN, VITAL SIGNS MONITORS, MODEL 106EL (6515-01-423-5796) AND 206EL (6515-01-423-5872, 6515-01-423-5796, 6515-01-432-2707, 6515-01-432-2711)**

a. Most of these items have the same problem, you repeatedly push the power button and the unit refuses to turn on. First, you should try installing a freshly charged battery. If the unit still does not turn on, completely separate the monitor from the expansion (printer) module. Using the power adapter, apply power to the monitor only. If the monitor comes on, then your problem is the printer and it will have to be replaced.

b. The part number for the 106EL printer assembly is 020-0475-00, and the part number for the 206EL is 020-0579-00. The current price is \$590.00 for either board. Once you receive the new printer assembly, the EPROM from the old printer will have to be installed into the new one.

c. Remember to always think SAFETY and use a static-free mat with wristband while working on equipment with the electronics exposed.

**2-19. REFRIGERATED CONTAINER, 8145-01-388-4966**

a. Appendix F identifies a maintenance problem and resolution for the 20-ft refrigerated container. Two containers were diagnosed with faulty circuit breakers; the resolution identifies a replacement circuit breaker that remedies the situation.

b. Call DSN 343-4465 or commercial 301-619-4465.

**2-20. RUGGEDIZED ADVANCED PATHOGEN IDENTIFICATION DEVICE, NSN 6630-01-462-8065**

This is a new unit that checks for pathogens in the blood. The user breaks down the DNA, puts in flourescences, then the system reads the amount of pathogen in the blood of the individual infected. This system also does a general search for all types of pathogens. The Bio Threat Screening kits have sample pathogens but these pathogens are harmless. The company still recommends that you use common lab practices to help minimize user errors on making these samples. The Bio Threat Screen kit contains harmless DNA that is freeze-dried of B Anthracis, F. Tularensis, Y. Pestis and Brucella species. There is a training kit

available to help you learn how to operate this unit. Call customer support at 800-735-6544. Classes are available to help you learn how to use this unit. You can also visit their web site at **www.idahotech.com**.

## 2-21. SOFTWARE UPGRADES

The following TO&E equipment have computer software required for calibration procedures: I-STAT, PICCOLO, 754M Ventilator, R.A.P.I.D., Pnueview, Alaris Infusion Pumps, Picker VP4, and the various CR Readers that the Army are currently using. You can obtain the following software by either contacting the USAMMA MMOD-CA at DSN 462-4557 / commercial 209-839-4557 or better yet, the manufacturers of the items stated above. The following table shows how often the software is needed for upgrades. Ensure you verify which software you need for the operating system you are using.

<b>Nomenclature</b>	<b>NSN</b>	<b>Scheduled Upgrades</b>
I-STAT	6630-01-411-2568	Quarterly
Piccolo	6630-01-415-1593	Semi-Annual
754M Ventilator	6530-01-464-0267	As needed per manufacturer
R.A.P.I.D., Model 7200CE	6630-01-462-8065	As needed per manufacturer
Pnueview	Model 3600i (test lung)	As needed per manufacturer
Alaris Infusion Pump	6515-01-452-0625	As needed per manufacturer
Picker VP4	6525-01-384-9296	As needed per manufacturer
CR Readers	Various	Undetermined

## 2-22. VOLTAGE SENSOR FOR THE SURGICAL LIGHT, FIELD, 6530-01-343-2033

a. When doing preventive maintenance on the field light, ensure that a voltage sensor has been installed. A good indication that a sensor is installed is if you see two mounting screws on the right side of the base unit (see Appendix G). Upon opening the top cover you should see a yellow box with two black knobs on it. If you don't see this it is time to install one. Installing the sensor should help prevent batteries from being overcharged and causing damage to the unit.

b. Parts are available from Getinge Castle. The voltage sensor part number is 302901 and the 8-pin socket part number is 302902. For installing the voltage sensor refer to Appendix G.

## **Appendix A. Tobyhanna Standing Operating Procedures**

U.S. Army Medical Materiel Agency  
Maintenance Engineering & Operations Directorate  
Medical Maintenance Operations Division, Tobyhanna PA  
External Standing Operating Procedure

MCMR-MMM-DP

April 2001

### **1. Purpose**

To provide guidance to units and organizations requesting services from the U.S. Army Medical Materiel Agency (USAMMA) Medical Maintenance Operations Division, Tobyhanna (MMOD-PA) at Tobyhanna Army Depot, Tobyhanna PA.

### **2. Scope**

These procedures are applicable to all units and activities requesting support.

### **3. Mission**

The USAMMA Medical Maintenance Operations Division, Tobyhanna, provides depot-level services and functions in support of TDA and TOE medical equipment and is the center of excellence for optical equipment, audiometers and dental handpieces. MMOD-PA has the capability to refurbish and rebuild medical equipment to like-new condition, provide repair and return services, administer a Medical Equipment Standby Equipment Program (MEDSTEP), and provide on-site support.

### **4. Hours of Operation**

Normal duty hours are 0630 to 1600 (ET) Monday through Friday. If you need assistance or service please contact the following personnel:

Chief	(570) 895-7744	DSN 795-7744
Shop Supervisor	(570) 895-7134	DSN 795-7134
Production Control	(570) 895-7601	DSN 795-7601
Work Order Status	(570) 895-7843	DSN 795-7843
Fax	(570) 895-7699	DSN 795-7699
Website:	<a href="http://www.usamma.army.mil/maintenance/index.html">http://www.usamma.army.mil/maintenance/index.html</a>	

### **5. Services Available**

5.1. Audiometer repair and calibration

5.2. Electronics repair and calibration

5.3. Optical repair and calibration

5.4. Dental handpiece repair

5.5. On-site technical assistance (requested through headquarters USAMMA)

5.6. Telephonic technical assistance

5.7. Military Entrance Processing Station (MEPS) Direct Exchange Program

5.8. Medical Equipment Standby Program



## 5.9. Training

## 6. Requesting Services

6.1 When shipping equipment for servicing please use the following address:

US Army Medical Materiel Agency  
Medical Maintenance Operations Division – PA  
Warehouse 4, Bay 1  
Tobyhanna Army Depot  
Tobyhanna PA 18466-5063  
DODAAC: W25AT5

6.2. All units, organizations, facilities or agencies other than active army (P84 and medical P1 funds) are required to reimburse USAMMA for all services. Army National Guard and Army Reserve units are not required to submit funding citations as their respective headquarters provide funds on an annual basis to cover their medical equipment. Funding documentation from other reimbursable customers must include the following:

- Document number to include owning DODAAC and address
- Funding citation
- Authorized amount (amount authorized for service)
- Point of contact and telephone number
- Nomenclature of item
- National stock number, management control number, or non-standard number
- Model number and quantity sent with serial numbers
- Any accessories, maintenance manuals, or other materiel that may be required to perform service on the equipment
- Identification of all accessories

6.3. Questions concerning funding or fund citations may be answered by calling the Production Controller at (570) 895-7601 or DSN: 795-7601.

6.4. All customers may request maintenance services by submitting either a DA Form 2407 (or automated equivalent), DD Form 1348-1 or DD Form 1149 shipping documents.

6.5. All equipment that comes in reusable containers should be shipped in those containers. All other equipment should be properly packaged so that no further damage will occur. Place a copy of the maintenance request inside the container with the equipment.

6.6. Accessories and maintenance manuals must be sent with the equipment to prevent delays in the repair or service. All accessories sent with the equipment shall be indicated in the remarks section of the shipping document.

6.7. The Maintenance Expenditures Limit (MEL) shall be included in the remarks section of the shipping form. Failure to include the MEL will result in delays.

## (continued) Appendix A. Tobyhanna Standing Operating Procedures

6.8. When active army units submit equipment that belongs to a serviced unit, the owning units address and DODAAC will be annotated in the remarks section of the shipping document.

6.9. Equipment items not listed in services available or on the USAMMA maintenance website will not be sent without prior coordination.

6.10. The USAMMA MMOD-PA is not responsible for billing customers. For questions concerning billing please call USAMMA's Resource Management Division at (301) 619-2111 or DSN 343-2111.

## 7. Direct Exchange

7.1. The MMOD-PA provides an equipment Direct Exchange Program for the MEPS. When a piece of equipment fails, the MEPS calls the MMOD-PA for an exchange. The replacement equipment is sent out immediately to the requesting MEPS. The MEPS then sends their broken equipment to MMOD-PA for repair and placement back into the Exchange Program.

7.2. The MMOD-PA provides a Direct Exchange Program for selected equipment. To qualify for a DX, the equipment must be the same make and model, and must be repairable. No direct exchange will be complete until both parties are satisfied with the equipment they received.

## 8. Medical Standby Equipment Program (MEDSTEP)

The MMOD-PA provides a loaner item for selected items. A list of MEDSTEP assets available at the MMOD-PA is published periodically in the SB 8-75 series bulletins. MEDSTEP assets may only be utilized to provide temporary replacement for equipment being serviced at the MMOD-PA. When the owners original equipment is received back, the MEDSTEP item, to include all accessories, must be returned to the MMOD-PA. Reimbursable customers that use MEDSTEP must provide funds as necessary to restore the MEDSTEP item back to serviceable condition.

## 9. Cannibalization Point

The MMOD-PA maintains unserviceable assets of selected medical equipment for cannibalization. Authorized customers may request parts from cannibalization for mission critical medical equipment when parts are not available from any other source.

## 10. Training

Repair and calibration training of various medical equipment is available. Training is tailored to meet your requirements. Training can be provided either in your facility or in the Division facilities. On-site training costs are based upon travel, per diem, the labor rate and training hours. Contact us about your training needs at (570) 895-7613 or DSN 795-7613.

Chief, Medical Maintenance  
Operations Division  
USAMMA

## Appendix B. Tracy Standing Operating Procedures

U. S. Army Medical Material Agency  
Maintenance Engineering & Operations Directorate  
Medical Maintenance Operations Division, Tracy California

### External Standing Operating Procedures

MCMR-MMM-DC

April 2001

#### 1. Purpose

To provide guidance to units and organizations requesting services from USAMMA's Medical Maintenance Operations Division-California (MCMR-MMM-DC) at Defense Distribution Center, Tracy Location, Tracy CA 95376-5050.

#### 2. Scope

These procedures are applicable to all units and activities requesting support.

#### 3. Mission

The USAMMA Medical Maintenance Operations Division, Tracy, provides depot-level services and functions in support of x-ray equipment and Special Purpose Test Measurement Diagnostic Equipment.

#### 4. Hours of Operation

Normal duty hours are 0500 to 1530 (PT) daily Monday through Friday, excluding holidays. A telephone recorder is available on DSN 462-4557 or commercial (209) 839-4557 and will record messages after duty hours. When leaving messages please speak clearly so your message will be understood. If you require a response, leave your name, telephone number, and the work order number, if available. Recorded calls will be responded to on the following workday.

	Commercial	DSN
Chief	209 839-4556	462-4556
Shop Supervisor	209 839-4560	462-4560
Program Administrator	209 839-4557	462-4557
Fax	209 839-4563	462-4563
Website	<a href="http://www.usamma.army.mil/maintenance/index.html">http://www.usamma.army.mil/maintenance/index.html</a>	

#### 5. Services Available

5.1. X-ray rebuild

5.2. X-ray tube repair/rebuild

5.3. On-site technical assistance (request must be made to HQ, USAMMA)

5.4. X-ray acceptance inspections (request must be made to HQ, USAMMA)

5.5. Telephonic technical assistance

5.6. X-ray repair and return services

5.7. Calibrate and repair special purpose test, measurement, and diagnostic equipment

5.8. Training

## 6. Requesting Services

6.1. When shipping equipment for repair or service, please use the following address:

U.S. Army Medical Materiel Agency  
 Medical Maintenance Operations Division  
 Building T-255, Tracy Site  
 25600 Chrisman Road  
 Defense Distribution Center  
 Tracy, CA 95376-5050  
 DODAAC: W62SEV

6.2. All units, organizations, facilities or agencies other than Active Army (P84 and medical P1 funded) are required to reimburse USAMMA for all services. Army National Guard and U.S. Army Reserve units are not required to submit fund citations as their respective headquarters provide funds on an annual basis to cover their medical equipment. Funding documentation from other reimbursable customers must include the following:

➤ Document number to include owning DODAAC or UIC, and address
➤ Funding citation
➤ Authorized funding (amount authorized for service)
➤ Point of contact and telephone number
➤ Nomenclature of item
➤ National stock number, management control number, or non-standard number
➤ Quantity of items to include serial numbers
➤ Any accessories, maintenance manuals, or other material which may be required to perform services on the equipment
➤ Identification of all accessories

6.3. Questions concerning funding or fund citations may be answered by calling DSN 462-4557 or commercial 209 839-4557.

6.4. All customers may request maintenance services on their medical equipment by submitting either a DA Form 2407 (or the automated equivalent) or DD Form 1348-1, Shipping Document.

6.5. All equipment that has reusable containers will be shipped in those containers. If equipment does not have reusable container equipment will be packed so that no further damage can occur.

6.6. Place a copy of the document being used as the maintenance request inside the shipping container with the equipment. The transportation personnel or the commercial carrier often removes documents placed on the outside of the container.

## (continued) Appendix B. Tracy Standing Operating Procedures

6.7. Accessories and maintenance manuals must be sent with the equipment to prevent delays in the repair or service. All accessories or materials sent with the equipment shall be indicated in the remarks section of the DA Form 2407 and DD Form 1348-1 or by other documentation.

6.8. The Maintenance Expenditure Limit (MEL) shall be included in the remarks section of either the DA Form 2407 or DD Form 1348-1. Failure to include the MEL will result in delay of repairs.

6.9. When Active Army units submit equipment to the MMOD-CA that belongs to another unit, the owning unit, address, and DODAAC will be given in the remarks section of either the DA Form 2407 or DD Form 1348-1. Unless otherwise specified, after repairs are completed the equipment will be returned to the owning unit.

6.10. Equipment items not listed in 5. Services or on the USAMMA Maintenance website should not be sent without prior coordination.

6.11. The USAMMA Medical Maintenance Operations Division-California (MMOD-CA) is not responsible for billing reimbursable customers. For questions concerning billing call USAMMA's Resources Management Division at DSN 343-2111 or commercial 301 619-2111.

6.12. Any questions regarding MMOD-CA's services, work order status, complaints, technical assistance or general information may be answered by calling DSN 462-4557/4556/4560 or commercial 209 839-4557/4556/4560. Please have the work order number available when you call.

#### 7. Direct Exchange of X-ray Tube Heads

An exchange for x-ray tubes may be requested by calling customer assistance at DSN 462-4560/4556 or commercial (209) 839-4560/4556. A questionnaire will be faxed to your activity to determine the appropriate information for the exchange.

#### 8. Medical Standby Equipment Program

The USAMMA MMOD-CA provides a Medical Standby Equipment Program (MEDSTEP) for selected x-ray equipment. A list of the MEDSTEP assets available at the MMOD-CA is published periodically in the SB 8-75 Series Bulletins. MEDSTEP assets may only be utilized to provide serviceable temporary replacement for equipment being serviced at the MMOD-CA. The USAMMA Maintenance Engineering and Operations Directorate must approve exceptions. Exceptions may be requested telephonically by calling DSN 343-4407 or commercial 301-619-4407. Once the owners original equipment is received back, the MEDSTEP item, to include all accessories, must be returned to the MMOD-CA. Reimbursable customers that use MEDSTEP must provide funds as necessary to restore the MEDSTEP item back to serviceable condition.

#### 9. Cannibalization Point

The USAMMA MMOD-CA maintains unserviceable assets of selected medical equipment for cannibalization. Authorized customers may request parts from cannibalization for mission critical medical equipment when parts are not available from any other source.

10. Training

Repair and calibration training of various x-ray equipment is available. Training is tailored to meet your requirements. Training can be provided either in your facility or in the Division facilities. On-site training costs are based upon travel, per diem, the labor rate and training hours. Contact us about your needs at DSN 462-4556 or commercial (209) 839-4556.

11. Test Measurement, and Diagnostic Equipment (TMDE)

All field medical unit special purpose TMDE-SP such as defibrillator testers, electro surgical test sets, and x-ray calibration sets are supported with repair and calibration services. To maintain capability when TMDE-SP is turned in for repair or calibration a like item may be borrowed.

Chief, Medical Maintenance  
Operations Division  
USAMMA

## **Appendix C. Hill Standing Operating Procedure**

U.S. Army Medical Materiel Agency  
Maintenance Engineering & Operations Directorate  
Medical Maintenance Operations Division, Hill AFB Utah  
External Standing Operating Procedure

MCMR-MMM-DU

April 2001

### **1. Purpose**

To provide guidance to units and organizations requesting services from the U.S. Army Medical Materiel Agency (USAMMA) Medical Maintenance Operations Division, (MMOD-UT) at Hill Air Force Base Utah.

### **2. Scope**

These procedures are applicable to all units and activities requesting support.

### **3. Mission**

The USAMMA Medical Maintenance Operations Division provides depot-level services and functions in support of all field TOE medical equipment (except x-ray). We have the capability to refurbish and rebuild field medical equipment to like-new condition, provide repair and return services, administer a Medical Standby Equipment Program (MEDSTEP) and on-site support.

### **4. Hours of Operation**

Our duty hours for the Maintenance Division are 0500 to 1630 (MT), Monday through Friday. If you need assistance or service for field TOE medical equipment, please contact the following personnel:

Chief	(801) 586-4947	DSN 586-4947
Shop Supervisor	DSN 586-4948	(801) 586-4948
Program Administrator	(801) 586-4946	DSN 586-4946
Fax	(801) 586-5058	DSN 586-5058

Website: **<http://www.usamma.army.mil/maintenance/index.html>**

### **5. Services Available**

5.1. On-site technical assistance (request must be made to HQ, USAMMA)

5.2. Telephonic technical assistance

5.3. Medical Equipment Standby Program

5.4. Repair of TO&E medical equipment

5.5. Parts support to AMEDD Limited Support Items (ALSI)

### **6. Requesting Services**

6.1. When shipping equipment for repair or service, please use the following address:

U.S. Army Medical Materiel Agency  
6149 Wardleigh Road  
Bldg. 1160, Bay 1  
Hill AFB, UT 84056-5848  
DODAAC: W81PYK

6.2. The owning or supporting unit is responsible for ensuring that the equipment is cleaned and disinfected prior to shipping the item to our Division for service.

6.3. Each equipment item must be shipped with the following:

- ◆ All accessories needed to operate, test and/or calibrate the unit manufacturer's service literature for non-standard equipment
- ◆ DA Form 2409 (for manual systems), or a work history printout (for automated systems)
- ◆ DA Form 2407 containing the following:
  - unit name and address
  - DODAAC
  - point of contact
  - commercial/fax telephone numbers
  - priority
  - brief description of the problem or requested service (i.e., repair and return)

We request that you contact us prior to shipping non-standard equipment.

6.4. Upon receipt of your equipment, an automated work order will be generated and faxed to your point of contact. Please reference our work order number regarding all inquiries.

6.5. When services are completed, the equipment will be shipped to your return address and POC. A copy of our closed automated work order will be returned with the equipment for updating your unit's records.

6.6. Equipment that is not economically repairable will be condition coded in accordance with applicable regulations. The owning or supporting unit will be notified for disposition instructions. Equipment items will be returned to your unit or disposed of locally, in which case your unit will be provided a copy of the closed automated work order and a signed copy of the DD Form 1348 for your records.

6.7. Repairs or services that will exceed the One Time Expenditures Limit (OTEL) or Maximum Expenditure Limit (MEL) will require a waiver approved by your organization commander or designee prior to the accomplishment of any repairs or services.

6.8. All units, organizations, facilities or agencies other than active army (P84 and medical P1 funds) are required to reimburse USAMMA for all services. Army National Guard and army reserve units are not required to submit funding citations as their respective headquarters provide funds on an annual basis to cover their medical equipment. Funding documentation from other reimbursable customers must include the following:



## (continued) Appendix C. Hill Standing Operating Procedure

- Document number to include owning DODAAC and address
- Funding citation
- Authorized amount (amount authorized for service)
- Point of contact and telephone number
- Nomenclature of item
- National stock number, management control number, or non-standard number
- Model number and quantity sent with serial numbers
- Any accessories, maintenance manuals, or other materiel that may be required to perform service on the equipment
- Identification of all accessories

6.9. On-site maintenance support for field TOE equipment is available from our Division and should be coordinated with us first to ensure availability of manpower and resources. All requests for on-site maintenance support must be through appropriate command channels to the Commander, U.S. Army Medical Materiel Agency, ATTN: MCMR-MMM, 1423 Sultan Drive, Fort Detrick, MD 21702-5001. Requests must include name and location of the requesting unit and work site, specific requirement to include estimated man-hours, recommendation, and priority from local command.

## 7. Repair Parts for Field TOE Equipment

7.1. Repair parts to support equipment for which the manufacturer or other sources will no longer supply parts may be requested from our Medical Maintenance Support Division, commercial 801-586-4949. All requests will require your unit name, address, DODAAC, point of contact, commercial/fax telephone numbers, the NSN of the end item and the part number(s) of the items requested.

7.2. Repair parts to support equipment for which the parts are available from the manufacturer or other sources will not be provided by us. We will however, assist you in obtaining a source of supply.

## 8. Medical Standby Equipment Program (MEDSTEP)

8.1. MEDSTEP assets will not be used to fill equipment shortages, replace uneconomically repairable items or expand operational missions.

8.2. MEDSTEP assets will be requested through our Medical Maintenance Support Division at commercial 801-586-4949. All requests will require your unit name, address, DODAAC, point of contact, commercial/fax telephone numbers, and a brief description of your requirement.

8.3. The requesting unit is responsible for the care and maintenance of the MEDSTEP item and to ensure the item is cleaned and properly packed prior to returning the item to our Division.

9. Cannibalization Point

The MMOD-UT maintains unserviceable assets of selected medical equipment for cannibalization. Authorized customers may request parts from cannibalization for mission critical medical equipment when parts are not available from any other source.

10. Training

Repair and calibration training of various medical equipment is available. Training is tailored to meet your requirements. Training can be provided either in your facility or in the Division facilities. On-site training costs are based upon travel, per diem, the labor rate and training hours. Contact us about your training needs at 801-586-4947.

Chief, Medical Maintenance Operations  
Division, Hill AFB, Utah  
USAMMA

## Appendix D. 754(M) Ventilator Checkout Procedures

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**754(M) PORTABLE VENTILATOR****TEST****PROCEDURES**

Rev. E C D C  
Page 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23,

Rev. C C D D  
Page 26, 27, 28, 29.

**Revision Record**

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4/22/99	99041	B to C
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## **754(M) TEST PROCEDURE**

### **GENERAL:**

- A. All tests performed with calibrated in house test equipment.
- B. Burn In unit per DHR Operational Settings.

### **1.1 CONNECTIONS**

- 1.1.1 Connect oxygen and external air to 754, pressurize to 50 PSI.
- 1.1.2 Connect disposable ventilator circuit to its respective gas outlet, transducer, and exhalation valve connectors.
- 1.1.3 Connect AC Power Supply between External Power Jack and external power source.
- 1.1.4 Connect battery pack.

### **1.2 SETTINGS**

- 1.2.1 Unless otherwise stated, use the following settings
  - 1.2.1.1 Mode = A/C
  - 1.2.1.2 Rate = 15 BPM
  - 1.2.1.3 I time = 1.0 second
  - 1.2.1.4 Vt = 500 ml
  - 1.2.1.5 FIO2 = 21%
  - 1.2.1.6 External Air = ON
  - 1.2.1.7 Sigh = OFF
  - 1.2.1.8 Peep = 0 cmH2O
  - 1.2.1.9 Pressure Plateau = OFF
  - 1.2.1.10 High Pressure Alarm = 100 cmH2O
  - 1.2.1.11 Low Pressure Alarm = 0 cmH2O.

**Note:** When going from one setting to another, a learning breath occurs as the unit's internal controls adjust. A Vt Alarm may occur during the learning breath, it deactivates on the next breath. This is acceptable.

### **1.3 RT-200**

- 1.3.1 When referring to the RT-200, the number in parenthesis given after the reference is the operating mode the RT-200 should be in for that test(Example: RT-200 (41) is the volume reading for oxygen).
- 1.3.2 A Disconnect Alarm may occur while using the RT-200 (especially during low gas flows). This happens because the RT-200 flow sensor's negligible backpressure produces no pressure rise sensed by the ventilator's airway transducer. This is acceptable.

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## 1.4 TEST LUNG

1.4.1 When using test lung, unless otherwise stated, use settings:

14.1.1  $R = 5$

14.1.2 Compliance = .050 L/cmH<sub>2</sub>O.

## 2.0 TIDAL VOLUME

### 2.1 OXYGEN

2.1.1 Set Air/Oxygen mixer control to 100%.

2.1.2 Connect disposable ventilator circuit to RT-200 (41).

2.1.3 Test the tidal volumes from 100 - 3000 ml using the settings given. Work from smallest to highest values:

<u>Vt Set</u>	<u>I Time</u>
100 ml	0.2 Sec
300 ml	1.2 Sec
500 ml	0.5 Sec
500 ml	0.6 Sec
500 ml	1.0 Sec
500 ml	1.5 Sec
500 ml	2.0 Sec
750 ml	1.0 Sec
3000 ml	3.0 Sec

2.1.4 When going from one setting to another, allow a learning breath to occur before taking measurements.

2.1.5 Tidal volume readings from RT-200 must be within +/- 10% of Vt setting.

### 2.2 EXTERNAL AIR

2.2.1 Set Air/Oxygen Mixer to 21%. Set external air to "ON".

2.2.2 Connect disposable ventilator circuit to RT-200 (42).

2.2.3 Test the tidal volumes from 100 - 3000 ml using the settings given in 2.1.3. Work from smallest to highest values.

2.2.4 When going from one setting to another, allow a learning breath to occur before taking measurements.

2.2.5 Tidal volume readings from RT-200 must be within +/- 10% of Vt setting.

### 2.3 COMPRESSOR

2.3.1 Set Air/Oxygen Mixer to 21%. Set external air to "OFF"

2.3.2 Connect disposable ventilator circuit to adult test lung.

2.3.2.1 Use a resistance of 5 and a compliance of .050 L/cmH<sub>2</sub>O.

2.3.2.2 Use one lung for tidal volumes from 100 - 2000 ml. Use dual lungs for 3000 ml setting.

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- 2.3.3 Test the tidal volumes from 100 - 3000 ml using the settings given in 2.1.3. Work from smallest to highest values.
- 2.3.4 When going from one setting to another, allow a learning breath to occur before taking measurements.
- 2.3.5 Tidal volume readings from test lung must be within +/- 10% of Vt setting.

**3.0 FIO2**

**Note:** The Oxygen Analyzer must be calibrated on a daily basis before initial use.

**3.1 EXTERNAL AIR & O2****3.1.1 Setup**

- 3.1.1.1 Set Air/Oxygen mixer control to 21%.
- 3.1.1.2 Set External Air to "On"
- 3.1.1.3 Connect disposable ventilator circuit to adult test lung.
  - 3.1.1.3.1 Use a resistance of 5 and a compliance of .050 L/cmH2O.
- 3.1.1.4 Set I time to 1.0 sec and Vt to 500 ml.
- 3.1.1.5 Connect oxygen sensor to 22 mm gas outlet. Connect 22 mm disposable hose to oxygen sensor.

**3.1.2 Measure oxygen concentrations**

- 3.1.2.1 Take oxygen concentration measurements at 21%, 40%, 60%, and 100%.
- 3.1.2.2 When making setting adjustments, allow a few breaths for the readings to settle.
- 3.1.2.3 Readings must be within +/- 10% of FIO2 settings.

**3.2 COMPRESSOR & O2****3.2.1 Setup**

- 3.2.1.1 Set Air/Oxygen mixer control to 21%.
- 3.2.1.2 Set External Air to "Off".
- 3.2.1.3 Connect disposable ventilator circuit to adult test lung.
  - 3.2.1.3.1 Use a resistance of 5 and a compliance of .050 L/cmH2O.
- 3.2.1.4 Set I time to 1.0 sec and Vt to 500 ml.
- 3.2.1.5 Connect oxygen sensor to 22 mm gas outlet. Connect 22 mm disposable hose to oxygen sensor.

**3.2.2 Measure oxygen concentrations**

- 3.2.2.1 Take oxygen concentration measurements at 21%, 40%, 60%, and 100%.
- 3.2.2.2 When making setting adjustments, allow a few breaths for the readings to settle.

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3.2.2.3 Readings must be within +/- 10% of FIO2 settings.

3.2.2.4 Readings may fluctuate more with compressor than with external air.

#### **4.0 PEEP**

##### **4.1 SETUP**

4.1.1 The default value for peep is 0 cmH2O.

4.1.2 Connect disposable ventilator circuit to test lung.

4.1.2.1 Use a resistance of 5 and a compliance of .050 L/cmH2O.

4.1.3 Use following unit settings

4.1.3.1 Mode = A/C

4.1.3.2 Rate = 15 BPM;

4.1.3.3 I = 1.0 SEC;

4.1.3.4 Vt = 500 ml.

4.1.3.5 FIO2 = 21% ; External Air = "OFF".

##### **4.2 CONTROL**

4.2.1 Press the peep push-button once.

4.2.1.1 An audible beep should occur.

4.2.1.2 The peep LCD indicator should increase by 1 cmH2O.

4.2.2 Repeatedly press peep push-button. Each time the push-button is pressed:

4.2.2.1 An audible beep should be heard.

4.2.2.2 The peep LCD indicator should increase by 1 cmH2O.

4.2.3 After reaching a value of 20 cmH2O, press the button once.

4.2.3.1 An audible beep should be heard.

4.2.3.2 The LCD indicator should read 0 cmH2O.

4.2.4 Press and hold the peep button.

4.2.4.1 One audible beep is heard.

4.2.4.2 The LCD indicator should begin to scroll up in value as long as the peep button is held.

4.2.4.3 After reaching 20 cmH2O, the peep value should scroll back to 0 cmH2O.

##### **4.3 PEEP LEAK**

4.3.1 Using 1/8 hosebarb tee, 1/8 ID tubing, and a 3/16 hosebarb x 1/8 hosebarb adapter, connect transducer line to RT-200 (12).

4.3.2 Set peep value to 4 cmH2O.

4.3.2.1 Unit will "learn" the peep value. Allow a minute or so for the unit to learn peep. You may need to lower the rate to 10 BPM to decrease learning time. During the learning phase, there may be some autotriggering. This is acceptable.



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4.3.2.2 When the unit has reached 4.0 cmH<sub>2</sub>O (+/- 1.5 cmH<sub>2</sub>O), record the value.

4.3.2.3 Turn rate to 1 BPM.

4.3.2.3.1 In 18 seconds after the last breath (19 sec - I time), an Apnea alarm should occur.

4.3.2.3.2 If an Assisted breath occurs before the Apnea alarm, the unit fails Peep Leak test.

4.3.2.3.3 Peep should cancel during Apnea alarm.

4.3.2.4 Cancel Apnea alarm. Peep should reset itself to pre-apnea setting.

4.3.3 Set peep value to 20 cmH<sub>2</sub>O. Set Rate to 15 BPM.

4.3.3.1 Unit will "learn" the peep value. Allow a minute or so for the unit to learn peep. You may need to lower the rate to 10 BPM to decrease learning time. During the learning phase, there may be some autotriggering. This is acceptable.

4.3.3.2 When the unit has reached 20.0 cmH<sub>2</sub>O (+/- 1.5 cmH<sub>2</sub>O), record the value.

4.3.3.3 Turn rate to 1 BPM.

4.3.2.3.1 In 18 seconds after the last breath (19 sec - I time), an Apnea alarm should occur.

4.3.2.3.2 If an Assisted breath occurs before the Apnea alarm, the unit fails Peep Leak test.

4.3.2.3.3 Peep should cancel during Apnea alarm.

4.3.3.4 Cancel Apnea alarm. Peep should reset itself to pre-apnea setting.

#### **4.4 COUGH PROTECTION**

4.4.1 Allow a minute or so for the unit to learn peep of 20 cmH<sub>2</sub>O.

4.4.2 Once peep is learned, during expiratory pause, push down on lung. This is simulating a patient cough.

4.4.2.1 The exhalation valve should open up.

4.4.2.2 Airway pressure should start to go down to 0 cmH<sub>2</sub>O.

4.4.2.3 An Assisted breath will be triggered when the airway pressure drops below baseline.

#### **4.5 HIGH PEEP ALARM**

4.5.1 Setup

4.5.1.1 Set Rate = 100 BPM.

4.5.1.2 I time = .2 Sec.

4.5.1.3 V<sub>t</sub> = 180 ml.

4.5.1.4 FIO<sub>2</sub> = 21%.

4.5.1.5 Peep = 4 cmH<sub>2</sub>O.



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4.5.1.6 External Air = "OFF."

4.5.2 Slowly increase rate until unit begins to autopeep. When the autopeep value goes higher than 4 cmH<sub>2</sub>O, the High Peep alarm will activate.

## **5.0 APNEA:**

### **5.1 SETUP**

5.1.1 Set External Air = "ON".

5.1.2 Connect disposable ventilator circuit to test lung.

5.1.2.1 Use a resistance of 5 and a compliance of .015 L/cmH<sub>2</sub>O

### **5.2 APNEA IN A/C & SIMV**

5.2.1 Use settings

5.2.1.1 Mode = A/C.

5.2.1.2 Rate = 15 BPM.

5.2.1.3 I time = 1.0 Sec.

5.2.1.4 Vt = 500 ml.

5.2.1.5 FIO<sub>2</sub> = 21%.

5.2.1.6 Peep = 0 cmH<sub>2</sub>O.

5.2.2 Reduce rate to 1 BPM.

5.2.2.1 Apnea alarm should trigger in 18 Sec (19 Sec - I time) after last breath.

5.2.2.2 Put hose circuit on RT-200 (45) and measure the rate. It should be 12 BPM (+/- 10%).

5.2.2.3 Using RT-200, measure I time (46) and Vt (42). They should both be at the current unit settings (+/- 10%).

5.2.3 Press the Mute/Cancel button and cancel Apnea. Settings should go back to pre-apnea conditions.

### **5.3 APNEA IN CPAP**

5.3.1 Connect disposable ventilator circuit to test lung.

5.1.2.1 Use a resistance of 5 and a compliance of .015 L/cmH<sub>2</sub>O

5.3.2 Use Settings

5.3.2.1 Mode = CPAP.

5.3.2.2 FIO<sub>2</sub> = 21%.

5.3.2.3 Peep = 0 cmH<sub>2</sub>O.

5.3.3 Generate an assisted breath by pulling up on test lung.

5.3.3.1 The Apnea-CPAP alarm should occur 10 seconds after the assisted breath.

5.3.3.2 The unit should have a PIP relief of 40 cmH<sub>2</sub>O(+/- 10%). Use the gauge on the test lung to measure this value.

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5.3.3.3 Using RT-200 (#45), measure the Rate. It should be 12 BPM (+/- 10%).

5.3.3.4 Using RT-200 (#46), measure the I time. It should be 1.667 Sec (+/-10%).

5.3.3.5 Using RT-200 (#36), measure the flow. It should be 30 LPM (+/- 10%).

5.3.4 Press the Mute/Cancel button and cancel Apnea. Settings should go back to pre-apnea conditions.

## **6.0 OPERATIONAL**

### **6.1 EXTERNAL POWER**

6.1.1 Connect AC Power Supply between External Power Jack and external power source.

6.1.2 Disconnect battery.

6.1.3 Verify unit operates while using external power.

### **6.2 BATTERY**

6.2.1 Connect battery.

6.2.2 Disconnect external power.

6.2.2.1 An External Power Fail alarm should occur. Check off this alarm in the Alarms section.

6.2.2.2 Cancel alarm by pushing Mute/Cancel button.

6.2.2.3 Power Information Center should read Battery icon "OK".

6.2.3 Verify unit operates while using battery power.

6.2.4 Reconnect External Power Supply and measure charging current going into battery.

### **6.3 POWER UP DEFAULTS**

6.3.1 With external air connected and pressurized.

6.3.1.1 Set External Air button to "OFF".

6.3.1.2 Set Peep = 4 cmH<sub>2</sub>O.

6.3.1.3 Set Sigh = "ON".

6.3.2 Turn off unit. Turn unit back on.

6.3.2.1 External Air LCD should read "ON"

6.3.2.2 Peep = 0 cmH<sub>2</sub>O

6.3.2.3 Sigh = Off.

6.3.3 Pressure Plateau also defaults to the Off position when the unit is first turned on. Sigh defaults to "OFF" when Pressure Plateau is turned on.

### **6.4 A/C MODE**

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**6.4.1 Control Breath**

6.4.1.1 Verify in the Assist/Control mode that unit gives control breaths at the given settings.

6.4.1.2 Use the following settings to verify the disposable ventilator circuit mushroom inflates and deflates properly and that there is no retard of patient exhalation. The airway pressure must reach 0 cmH<sub>2</sub>O before the start of the next breath.

6.4.1.2.1 Resistance = 20

6.4.1.2.2 Compliance = .050 L/cmH<sub>2</sub>O

6.4.1.2.3 Rate = 20 BPM

6.4.1.2.4 I time = 1.0 sec.

6.4.1.2.5 V<sub>t</sub> = 500 ml

6.4.1.2.6 Using compressor.

**6.4.2 Assisted Breath**

6.4.2.1 Put rate to 8 BPM.

6.4.2.2 Connect hose circuit to test lung.

6.4.2.3 During expiratory pause, pull up on lung to generate a negative pressure. When a negative pressure is sensed, an assisted breath should be given at the current settings.

**6.5 SIMV**

**6.5.1 Control Breath**

6.5.1.1 Verify in the SIMV mode that unit gives control breaths at the given settings.

**6.5.2 Assisted Breath**

6.5.2.1 Put rate to 8 BPM.

6.5.2.2 Connect hose circuit to test lung.

6.5.2.3 During expiratory pause, pull up on lung to generate a negative pressure. When a negative pressure is sensed in the "time window":

6.5.2.3.1 An Assisted breath is generated

6.5.2.3.1 The inspiratory cycle is synchronized with the patient's ventilatory effort.

**6.5.3 Demand Breath**

6.5.3.1 Put rate to 8 BPM.

6.5.3.2 Connect hose circuit to test lung.

6.5.3.3 During expiratory pause, pull up on lung to generate a negative pressure. When a negative pressure is sensed outside the "time window":

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6.5.3.3.1 A Demand breath is generated

6.5.3.3.2 The inspiratory cycle is not affected by this breath.

6.5.3.4 The flow of a Demand breath has a default value of 60 LPM.

Connect hose circuit to RT-200 (36). Use 21% external air.

Disconnect green transducer line from patient valve. Cover up fitting hole and generate a negative pressure by gently pulling in on green transducer hose using a syringe. Either a demand breath or an assisted breath will be generated. The flow of the demand breath should be 60 LPM (+/- 10%).

## **6.6 CPAP**

6.6.1 Spontaneous Flow

6.6.1.1 Put unit in CPAP mode.

6.6.1.2 Generate a spontaneous flow as described in 6.5.3.4. Flow should be 60 LPM (+/- 10%).

6.6.2 Demand

6.6.2.1 Reconnect green transducer line to patient valve. Connect hose circuit to test lung.

6.6.2.2 Generate a demand breath by pulling up on test lung. The demand breath should last as long as there is a negative pressure being generated. Verify by varying duration and strength of negative pressure generation.

## **7.0 CONTROLS / ALARMS / LCD INDICATORS**

**Note:** For each of the following controls, make sure the push-buttons and knobs operate smoothly. For push-buttons, make sure they do not hang up. For knobs, check that they are aligned, tight, and have full range of motion. When checking controls, verify associated alarms operate per operators manual. Verify the control's LCD setpoints read the proper values.

### **7.1 EXTERNAL AIR**

7.1.1 Push-button Control

7.1.1.1 With external air connected (FIO2 = 21%), turn on unit. External Air LCD should read "ON".

7.1.1.2 Press the External Air push-button control

7.1.1.2.1 LCD setpoint should toggle to "OFF".

7.1.1.2.2 Unit should switch to compressor operation.

7.1.1.3 Press push-button again.

7.1.1.3.1 LCD setpoint should toggle back to "ON"

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7.1.1.3.2 Unit should resume external air operation.

**7.1.2 External Air Low/Fail Alarm**

7.1.2.1 Lower the external air pressure to 35 PSI (+/- 2 PSI)

7.1.2.1.1 The External Air Low/Fail alarm should activate

7.1.2.1.2 Unit should switch to compressor mode.

7.1.2.2 Restore external air pressure to 45 PSI (+/- 2 PSI)

7.1.2.2.1 Alarm should deactivate.

7.1.2.2.2 Unit should switch to external air mode.

**7.2 SIGH**

**7.2.1 Push Button Control**

7.2.1.1 Press the Sigh push-button control.

7.2.1.1.1 LCD should switch to "ON".

7.2.1.1.2 Verify that the first breath after the push-button control is turned on is a sigh breath. A sigh breath's I time and tidal volume are 150% of set values.

7.2.1.1.3 The next breath after the sigh breath should be a normal breath.

7.2.1.2 Press the Sigh push-button control again.

7.2.1.2.1 LCD should switch to "OFF".

7.2.1.3 Sigh is disabled when Pressure Plateau is turned on. It is also disabled in CPAP mode.

**7.3 PRESSURE PLATEAU**

**7.3.1 Setup**

7.3.1.1 Connect hose circuit to test lung.

7.3.1.1.1 Use a resistance of 5 and compliance of .050 L/cmH<sub>2</sub>O.

7.3.1.2 Use settings

7.3.1.2.1 Rate = 15 BPM.

7.3.1.2.2 I time = 1.0 Sec.

7.3.1.2.3 V<sub>t</sub> = 750 ml.

**7.3.2 Push-button-Control**

7.3.2.1 Press the Pressure Plateau push-button control. The LCD setpoint should toggle from "OFF" to the high pressure alarm setting minus 10 cmH<sub>2</sub>O.

7.3.2.2 Turn the high pressure alarm control to 100 cmH<sub>2</sub>O. Verify that the Pressure Plateau LCD setpoint reads 90.

**7.3.3 Plateau Volume Alarm**

7.3.3.1 Turn the high pressure alarm control to 20 cmH<sub>2</sub>O.

7.3.3.1.1 The Pressure Plateau LCD setpoint should read 10.



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7.3.3.1.2 Plateau Volume Alarm should activate.

7.3.3.1.3 The tidal volume being delivered to the test lung should be limited to Pressure Plateau pressure setting.

7.3.3.2 Press the Mute/Cancel push-button control.

7.3.3.2.1 The audible buzzer should deactivate.

7.3.3.2.2 The alarm LED should deactivate.

7.3.3.2.3 The AMC should still display the Plateau Volume Alarm.

7.3.3.3 Turn the High Pressure Alarm LCD setpoint to 30 cmH<sub>2</sub>O.

7.3.3.3.1 Pressure Plateau LCD should read 20.

7.3.3.3.2 Plateau Volume Alarm should deactivate.

#### **7.4 HIGH PRESSURE ALARM**

##### **7.4.1 Setup**

7.4.1.1 Connect hose circuit to test lung.

7.4.1.1.1 Use a resistance of 5 and a compliance of .050 L/cmH<sub>2</sub>O.

7.4.1.2 Use settings

7.4.1.2.1 Rate = 15 BPM.

7.4.1.2.2 I time = 1.0 sec.

7.4.1.2.3 V<sub>t</sub> = 850 ml.

##### **7.4.2 High Pressure Alarm**

7.4.2.1 Turn the High Pressure Alarm control to 100 cmH<sub>2</sub>O. Verify the corresponding High Pressure bar graph tic goes to 100 cmH<sub>2</sub>O.

7.4.2.2 Turn the High Pressure control to 50 cmH<sub>2</sub>O; High Pressure bar graph tic should move to 50 cmH<sub>2</sub>O.

7.4.2.3 Turn High Pressure control to 15 cmH<sub>2</sub>O;

7.4.2.3.1 High Pressure bar graph tic should move to 15 cmH<sub>2</sub>O.

7.4.2.3.2 The tidal volume being delivered to the test lung should be limited to the High Pressure Alarm pressure setting.

7.4.2.3.3 After four consecutive breaths where the High Pressure setting is reached, the High Pressure Alarm should activate.

7.4.2.4 Turn the High Pressure control to 30 cmH<sub>2</sub>O.

7.4.2.4.1 High Pressure bar graph tic should move to 30 cmH<sub>2</sub>O.

7.4.2.4.2 After four consecutive breaths where the High Pressure setting is not reached, the High Pressure Alarm should deactivate.

##### **7.4.3 Pressure Alarm Settings Alarm**

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7.4.3.1 Turn the Low Pressure control to 40 cmH<sub>2</sub>O and the High Pressure control to 30 cmH<sub>2</sub>O. The Pressure Alarm Settings Alarm should activate.

7.4.3.2 Turn Low Pressure control to 0 cmH<sub>2</sub>O and the High Pressure Alarm to 100 cmH<sub>2</sub>O. Pressure Alarm Settings Alarm should deactivate.

**7.5 LOW PRESSURE ALARM****7.5.1 Setup**

7.5.1.1 Connect hose circuit to test lung.

7.5.1.1.1 Use a resistance of 5 and a compliance of .050 L/cmH<sub>2</sub>O.

7.5.1.2 Use settings

7.5.1.2.1 Rate = 15 BPM.

7.5.1.2.2 I time = 1.0 sec.

7.5.1.2.3 V<sub>t</sub> = 850 ml.

**7.5.2 Low Pressure Alarm**

7.5.2.1 Turn the Low Pressure Alarm control to 10 cmH<sub>2</sub>O. Verify the corresponding Low Pressure bar graph tic goes to 10 cmH<sub>2</sub>O.

7.5.2.2 Turn the Low Pressure control to 50 cmH<sub>2</sub>O;

7.5.2.2.1 Low Pressure bar graph tic should move to 50 cmH<sub>2</sub>O.

7.5.2.2.2 After two consecutive breaths where the peak airway pressure does not reach the Low Pressure setting, the Low Pressure Alarm should activate.

7.5.2.3 Turn the Low Pressure setting to 10 cmH<sub>2</sub>O.

7.5.2.3.1 Low Pressure bar graph tic should move to 10 cmH<sub>2</sub>O.

7.5.2.3.2 After two consecutive breaths where the peak airway pressure is at or greater than the Low Pressure setting, the alarm should deactivate.

**7.6 RATE****7.6.1 Setup**

7.6.1.1 Use RT-200 (45) and external air.

7.6.2 Turn Rate control to 15 BPM.

7.6.2.1 Set I time = 1.0 sec. and V<sub>t</sub> = 500 ml.

7.6.2.2 Verify Rate measures 15 BPM (+/- 10%).

7.6.3 Turn Rate control to 60 BPM.

7.6.3.1 Set I time = 0.5 sec and V<sub>t</sub> = .500 ml.

7.6.3.2 Verify Rate measures 60 BPM (+/- 10%).

7.6.4 Turn Rate control to 150 BPM.

7.6.4.1 Set I time = 0.2 sec and V<sub>t</sub> = 200 ml.

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7.6.4.2 Verify Rate measures 150 BPM (+/- 10%).

**7.7 I TIME****7.7.1 Setup**

7.7.1.1 Use RT-200 (46) and external air.

7.7.1.2 Set  $V_t = 500$  ml.

7.7.2 Turn Inspiration Time control to 0.5 sec.

7.7.2.1 Set Rate = 15 BPM.

7.7.2.2 Verify I time measures 0.5 Sec (+/- 10%).

7.7.3 Turn I time control to 2.0 sec.

7.7.3.1 Set Rate = 15 BPM.

7.7.3.2 Verify I time measures 2.0 Sec (+/- 10%).

7.7.4 Turn I time control to 3.0 sec.

7.7.4.1 Set Rate = 10 BPM.

7.7.4.2 Verify I time measures 3.0 Sec (+/- 10%).

**7.7.5 Default 1:2 I:E Ratio**

7.7.5.1 Turn Inspiration Time control fully counter clockwise.

7.7.5.2 Verify 1:2 default I:E ratio with RT-200 (48).

**Note:** Tidal Volume Control and LCD indicator can be checked off from earlier Tidal Volume tests (See Section 2.0) Air/Oxygen Mixer Control and LCD indicator can be checked off from earlier Air/Oxygen Mixer tests (See Section 3.0).

**7.8 MUTE/CANCEL****7.8.1 Muting An Alarm**

7.8.1.1 Generate a Disconnect alarm.

7.8.1.2 Press the Mute/Cancel push-button control.

7.8.1.2.1 The audible alarm should mute for 30 seconds. After 30 seconds, the audible alarm should come back on.

7.8.1.2.2 The alarm LED should go from blinking to solid on for 30 seconds. After 30 seconds, the alarm LED should start blinking again.

7.8.1.2.3 The Alarm Message Center should still display the Disconnect alarm.

7.8.1.3 Fix disconnect condition. Alarm should deactivate.

**7.8.2 Canceling an alarm**

7.8.2.1 Disconnect external power. An External Power Fail alarm should occur.

7.8.2.2 Press the Mute/Cancel push-button control.



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- 7.8.2.2.1 The audible alarm should stop.
- 7.8.2.2.2 The alarm LED should turn off.
- 7.8.2.2.3 The AMC should show no alarm.

## **7.9 MANUAL BREATH**

### **7.9.1 Setup**

7.9.1.1 Connect hose circuit to test lung.

7.9.1.2 Use settings

7.9.1.2.1 Mode = A/C.

7.9.1.2.2 Rate = 10 BPM.

7.9.1.2.3 I time = 1.0 sec.

7.9.1.2.4 Vt = 500 ml.

7.9.2 Press the Manual Breath push-button control during an expiratory pause.

7.9.2.1 The unit should give an audible beep.

7.9.2.2 A control breath at the given settings should be generated.

7.9.3 Press and release the Manual Breath push-button control during an inhalation or exhalation.

7.9.3.1 Nothing should happen.

7.9.4 Press and hold the Manual Breath push-button control during inhalation.

When the current breath is over, and the test lung reaches baseline airway pressure.

7.9.4.1 The unit should give an audible beep

7.9.4.2 A control breath at the given settings should be generated..

**Note:** The Manual Breath push-button control should activate only one control breath when it is depressed, and it should only trigger at baseline airway pressure.

## **7.10 MODE**

### **7.10.1 Off Mode**

7.10.1.1 Turn Mode control switch to the OFF mode. Unit should turn off and be non-operational.

### **7.10.2 A/C Mode**

7.10.1.1 Turn Mode control switch to A/C mode.

7.10.1.2 Unit should power up and go into A/C mode.

7.10.1.2 Verify the LCD screen reads "Mode = A/C".

### **7.10.3 SIMV Mode**

7.10.3.1 Turn the Mode control switch to SIMV mode.

7.10.3.2 Unit should go into SIMV mode.

7.10.3.3 Verify the LCD screen reads "Mode = SIMV".

### **7.10.4 CPAP Mode**

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- 7.10.4.1 Turn the Mode control switch to CPAP mode.
- 7.10.4.2 Unit should go into CPAP mode.
- 7.10.4.3 Verify the LCD screen reads "Mode = CPAP".
- 7.10.4.4 In the CPAP mode, the Rate, Inspiration Time, and Tidal Volume controls are non-functional, and their corresponding LCD indicators should be blank.
- 7.10.5 CAL Mode
  - 7.10.5.1 Turn the Mode control switch to CAL mode and turn it back to CPAP mode before the calibration is complete. The unit should give a Calibration Abort Alarm.
  - 7.10.5.2 Turn unit to the CAL mode again.
    - 7.10.5.2.1 Verify the unit calibrates.
    - 7.10.5.2.2 The LCD reads "CAL = OK".
- 7.10.6 Autocal Valve Check
  - 7.10.6.1 Turn Mode control switch to A/C mode.
  - 7.10.6.2 Connect syringe to green transducer fitting using 1/8 ID tubing and pressurize to 20 cmH<sub>2</sub>O.
  - 7.10.6.3 Turn Mode control to Cal mode and let unit calibrate.
  - 7.10.6.4 Turn Mode control back to A/C mode.
  - 7.10.6.5 Remove syringe from transducer fitting. The airway pressure baseline should be at 0 cmH<sub>2</sub>O.

**8.0 LCD VISUAL INDICATORS:****8.1 Vmin**

- 8.1.1 Turn unit to A/C mode.
  - 8.1.1.1 The minute volume (Vmin) should be given in liters.
- 8.1.2 Turn unit to SIMV mode.
  - 8.1.2.1 The Vmin display blanks in the SIMV, CPAP, and CAL modes.

**8.2 INSPIRATION/EXHALATION**

- 8.2.1 Indicator should display "INSPIRATION" during inspiration in A/C, SIMV, and CPAP modes.
- 8.2.2 Indicator should display "EXHALATION" during exhalation or expiratory pause in A/C, SIMV, and CPAP modes.
- 8.2.3 Indicator blanks in CAL mode.

**8.3 POWER INFORMATION CENTER**

**Note:** The Power Information Center (PIC) occupies a two line area in the LCD's lower left hand section. The first line is external power information. The second line is battery power information.

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8.3.1 External Power Information (PIC Line 1) will display one of 5 different messages.

8.3.1.1 "EXT PWR ON" denotes operation from an external power source.

8.3.1.1.1 Connect external power source.

8.3.1.1.2 Verify PIC Line 1 reads "EXT PWR ON"

8.3.1.2 "EXT PWR LOW" occurs during operation with a low external power source.

8.3.1.3 "EXT PWR FAIL" occurs when external power fails during operation and a battery is connected.

8.3.1.4 "EXT CHK FUSE" occurs when external power fuse blows or is removed, and unit continues to operate on battery power.

**Note:** When the external power fuse is blow or removed, an External Power Fail alarm initially occurs. The PIC Line 1 displays the "EXT PWR FAIL" message. After pressing the Mute/Cancel push-button, the External Power Fail alarm is canceled, and the "EXT CHK FUSE" blinking message takes the place of the "EXT PWR FAIL" message.

8.3.1.5 PIC Line 1 is blank during normal battery operation.

8.3.2 Battery Power Information (PIC Line 2) will display one of 5 different messages.

8.3.2.1 External Power Connected. The second line will read

8.3.2.1.1 Battery icon "ON CHG" if the battery is being charged

8.3.2.1.2 Battery icon "CHK FUSE" if the battery fuse is blown or missing.

8.3.2.1.3 Blank if the battery is fully charged.

8.3.2.2 No External Power Connected. The second line will read

8.3.2.2.1 Battery icon "OK" if the battery is good.

8.3.2.2.2 Battery icon "LOW" if the battery is low.

#### **8.4 Paw**

**Note:** The Paw indicator represents a continuous and updating display of airway pressure. It displays the most recent 12-second period. Airway pressure amplitude along the vertical axis is also shown on adjacent bar graph. Each pixel is 2 cmH<sub>2</sub>O in the vertical axis. Markings along the horizontal axis represent 1-second intervals, and each pixel is 0.1 second in the horizontal axis.

8.4.1 Remove patient circuit from test lung

8.4.2 Occlude hose such that the airway pressure reaches 100 cmH<sub>2</sub>O.

8.4.2.1 Verify the Paw indicator goes to 100 cmH<sub>2</sub>O.

8.4.2.2 There should be no missing lines or pixels on zero baseline.

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**Note:** The digital bar graph corresponds with the Paw display. Each pixel is 2 cmH<sub>2</sub>O in the vertical axis. The markings on the bar graph are 10 cmH<sub>2</sub>O apart.

8.5.1 During the Paw test above.

8.5.1.1 Verify the digital bar graph goes to 100 cmH<sub>2</sub>O.

8.5.1.2 There should be no missing lines or pixels in the bar graph.

**8.6 PEAK AIRWAY PRESSURE**

8.6.1 Connect patient circuit to test lung.

8.6.2 Unit displays the peak airway pressure of the previous breath above the bar graph.

8.6.2.1 Verify display reads "PEAK=##cmH<sub>2</sub>O" where "##" is a one or two digit value representing the peak airway pressure in cmH<sub>2</sub>O.

8.6.2.2 Verify the value using test lung gauge.

**8.7 MEAN AIRWAY PRESSURE**

8.7.1 Setup: Connect patient circuit to test lung.

8.7.2 Unit displays the mean airway pressure below the peak airway pressure display.

8.7.2.1 Verify display reads "MEAN=##cmH<sub>2</sub>O" where "##" is a one or two digit value representing the mean airway pressure in cmH<sub>2</sub>O.

**9.0 LED INDICATORS:****9.1 CHARGE**

9.1.1 Setup. Connect external power supply and disconnect battery.  
Connect 30 ohm dummy load in place of battery.

9.1.2 Charge LED should come on. It may take a few minutes for charge LED to light.

**9.2 ALARM**

9.2.1 Generate a Disconnect alarm.

9.2.2 Alarm LED should blink.

9.2.3 Press the Mute/Cancel push-button. The Alarm LED should come on solid.

9.2.4 Fix disconnect condition, Alarm LED should turn off.

**9.3 SYSTEM FAIL LED AND ALARM**

9.3.1 Setup. Connect external power and battery. Go into A/C mode.

9.3.2 Remove the top fuse.

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9.3.2.1 An External Power Fail alarm should occur.

9.3.2.2 Press the Mute/Cancel push-button.

9.3.2.2.1 The External Power Fail alarm should cancel.

9.3.2.2.2 The PIC line 1 should read "CHK EXT FUSE".

9.2.3 Remove the bottom fuse with the top fuse still removed.

9.2.4.1 The System Failure LED should come on solid.

9.2.4.2 The audible alarm should give a continuous tone.

9.2.4.3 The LCD screen should blank.

9.2.4.4 The unit should shut down.

## 10.0 ALARMS

### 10.1 DISCONNECT

10.1.1 Setup. Remove patient circuit from test lung.

10.1.2 A Disconnect Alarm should occur when the next breath is fired and no positive airway pressure rise is sensed.

10.1.3 Connect patient circuit to test lung. The Disconnect Alarm should cancel on the next breath.

### 10.2 FIO2 & O2 LOW/FAIL

10.2.1 Setup Set oxygen concentration to 60%. Connect patient circuit to test lung.

10.2.2 Lower oxygen tank pressure to 35 PSI +/- 2 PSI.

10.2.2.1 The O2 Low/Fail alarm should occur.

10.2.2.2 The FIO2 alarm should occur.

10.2.2.3 Verify the tidal volume is maintained by external air or compressor.

10.2.3 Turn oxygen concentration to 21%.

10.2.3.1 Alarms should cancel.

10.2.3.2 Verify the tidal volume is maintained by external air or compressor.

10.2.4 Set oxygen concentration back to 60%.

10.2.4.1 The O2 Low/Fail alarm should occur again.

10.2.4.2 The FIO2 alarm should occur again.

10.2.4.3 Verify the tidal volume is maintained by external air or compressor

10.2.5 Return oxygen tank pressure to 45 PSI +/- 2 PSI.

10.2.5.1 Alarms should cancel.

10.2.5.2 Verify tidal volume is maintained by oxygen with external air or compressor.

### 10.3 Vt & Vt SETTINGS



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**Rev. C****10.3.1 Setup****10.3.1.1 Use the following settings:****10.3.1.1.1 Rate = 15 BPM.****10.3.1.1.2 I time = 1.0 seconds.****10.3.1.1.3 Vt = 800 ml.****10.3.2 Change Vt to 1050 ml.****10.3.2.1 A Vt Settings alarm should occur.****10.3.2.2 Press the Mute/Cancel push-button.****10.3.2.2.1 The alarm LED and audible should turn off.****10.3.2.2.2 The AMC message should remain.****10.3.3 Increase Vt setting to 1150 ml.****10.3.3.1 A Vt alarm should occur****10.3.3.2 The alarm LED and audible should come back on.****10.3.3.3 The Vt alarm will displace the Vt Settings alarm as the first on the AMC, but Vt settings alarm will remain as the second alarm.****10.3.4 Decrease Vt setting to 500 ml.****10.3.4.1 Alarms should cancel.****10.4 I TIME TRUNCATED TO 3-SEC****10.4.1 Setup****10.4.1.1 Set I time control to fully counter clockwise. This is the default 1:2 I:E Ratio setting.****10.4.2 Turn the rate control to 6 BPM.****10.4.2.1 The I Time Truncated To 3-Sec alarm should occur.****10.4.1.2 Press the Mute/Cancel push-button.****10.4.1.2.1 The alarm LED and audible should turn off****10.4.1.2.2 The AMC message should remain.****10.4.3 Increase the rate to 7 BPM.****10.4.3.1 The alarm cancels and the AMC message blanks****10.5 EXTERNAL POWER FAIL:** This alarm has been checked in section 6.2.2.1.**10.6 INVERSE I:E:****10.6.1 Setup****10.6.1.1 Use the following settings****10.6.1.1.1 Rate = 30 BPM.****10.6.1.1.2 I time = 1.0 seconds.****10.6.1.1.3 Vt = 800 ml.****10.6.2 Increase I time to 1.1 seconds.****10.6.2.1 An Inverse I:E alarm should occur.****10.6.2.1.1 Alarm is non mutable**

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10.6.2.1.2 Alarm is a Non-Operating alarm.

10.6.3 Decrease I time to 1.0 seconds

10.6.3.1 Alarm should cancel.

## **10.7 COMP**

10.7.1 Setup

10.7.1.1 Use the following settings

10.7.1.1.1 Rate = 150 BPM.

10.7.1.1.2 I time = 0.2 seconds.

10.7.1.1.3 Vt = 200 ml.

10.7.1.1.4 External Air = "ON".

10.7.2 Press the External Air push-button control.

10.7.2.1 The LCD indicator should read "OFF".

10.7.2.2 The compressor should start to operate.

10.7.3 Press the External Air push-button control again after one compressor breath.

10.7.3.1 The LCD indicator should read "ON".

10.7.3.2 The compressor should stop.

10.7.3.3 The external air valves should start operating.

**Note:** During this switching back and forth between External air and compressor operation, Vt and Disconnect alarms may be occurring. This is acceptable. The purpose of this procedure is to artificially induce a Comp alarm.

10.7.4 Press the External Air push-button control again after one external air breath.

10.7.4.1 The LCD indicator should read "OFF"

10.7.4.2 The compressor should try to start.

10.7.4.3 Along with possible Vt and Disconnect alarms, a Comp alarm should occur

10.7.4.3.1 During Comp alarm, the external air valves supply the gas source.

**Note:** You can generate Failure Code 2 (No Gas, Comp) Alarm here by lowering external gases to below 35 PSI +/- 2 PSI.

## **10.8 TOTAL FLOW BACKUP**

10.8.1 Setup

10.8.1.1 Use settings

10.8.1.1.1 Rate = 15 BPM.

10.8.1.1.2 I time = 1.0 sec.

10.8.1.1.3 Vt = 900 ml.

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10.8.1.1.4 FIO<sub>2</sub> = 21%.

10.8.1.1.5 External Air = "OFF".

10.8.2 Partially occlude the compressor inlet fitting such that the actual tidal volume is less than half of the set tidal volume. After 4-5 breaths..

10.8.2.1 A Total Flow Backup Alarm should occur.

10.8.2.2 Press the Mute/Cancel push-button.

10.8.2.2.1 The alarm LED and audible alarm should turn off.

10.8.1.1.2 The AMC message should remain.

**Note:** There are two alarms that cannot be checked during the final test procedures. They are Extended Non-Use and Preventative Maintenance alarms.

## **11.0 SAFETY SHUTDOWN**

**Note:** The Safety Shutdown (40 cmH<sub>2</sub>O for 4 seconds) is tested during the generating of Failure Code 5 alarm. See section 12.5.

## **12.0 VENT FAIL**

**Note:** To do Ventilator Failure Code tests, a syringe and a piece of 1/8 ID tubing are needed.

### **12.1 VENTILATOR FAILURE CODE 1**

**Note:** This Failure Code occurs when Self Check fails during startup. It cannot be checked during the final test procedures.

### **12.2 VENTILATOR FAILURE CODE 2**

#### **12.2.1 Setup**

12.2.1.1 Use External Air.

12.2.1.2 Disconnect oxygen supply.

12.2.1.3 Generate a COMP alarm per Section 10.7.

12.2.2 After getting COMP alarm, disconnect external air and oxygen supplies.

12.2.2.1 Unit should shut down.

12.2.2.2 Verify unit gives a Failure Code 2 (No Gas, COMP) alarm.

### **12.3 VENTILATOR FAILURE CODE 3**

**Note:** This Failure Code occurs when Excessive Airway Pressure is sensed during startup. It cannot be checked during the final test procedures.

### **12.4 VENTILATOR FAILURE CODE 4**

**Note:** This Failure Code occurs when a memory check fails. It cannot be checked during the final test procedures.



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## 12.5 VENTILATOR FAILURE CODES 5

**Note:** When testing Failure Code 5 the 40 cmH<sub>2</sub>O for 4 seconds Safety Shutdown will also occur.

### 12.5.1 Setup

#### 12.5.1.1 Use settings

12.5.1.1.1 Mode = A/C.

12.5.1.1.2 Rate = 15 BPM.

12.5.1.1.3 I time = 1.0 sec.

12.5.1.1.4 V<sub>t</sub> = 500 ml.

12.5.1.1.5 FIO<sub>2</sub> = 21%.

#### 12.5.1.2 Connect to test lung.

12.5.1.3 With unit operating, disconnect green transducer hose, and connect syringe with hose to transducer fitting. A disconnect alarm may occur, ignore it.

### 12.5.2. Slowly pressurize syringe until airway pressure is above 40 cmH<sub>2</sub>O.

After 4 seconds above 40 cmH<sub>2</sub>O the safety shutdown should occur.

12.5.2.1 The exhaust valve opens and stays open.

12.5.2.2 The system fail LED comes on.

12.5.2.3 Audible alarm comes on continuously.

### 12.5.3 Increase the airway pressure to +100 cmH<sub>2</sub>O. After 2 seconds

12.5.3.1 Unit should shut down.

12.5.3.2 Verify unit gives a Failure Code 5 (Exhaust Valve Failure) alarm.

## 12.6 VENTILATOR FAILURE CODE 6

### 12.6.1 Setup

#### 12.6.1.1 Use Settings

12.6.1.1.1 Mode = A/C.

12.6.1.1.2 Rate = 15 BPM.

12.6.1.1.3 I time = 1.0 sec.

12.6.1.1.4 V<sub>t</sub> = 500 ml.

12.6.1.1.5 FIO<sub>2</sub> = 21%.

12.6.1.2 Connect to test lung. With unit operating, disconnect green transducer hose, and connect syringe with hose to transducer fitting. A disconnect alarm may occur, ignore it.

### 12.6.2 Decrease pressure with syringe until airway pressure is -10 cmH<sub>2</sub>O. After 1 1/2 seconds

12.6.2.1 Unit should shut down

12.6.2.2 Verify unit gives a Failure Code 6 (Excessive Negative Pressure) alarm.

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## **12.7 VENTILATOR FAILURE CODE 7**

**Note:** This Failure Code occurs when a Run-Time Transducer Calibration fails. It cannot be checked during the final test procedures.

## **13.0 USER PROGRAMS**

**Note:** To go into the User Program mode, simultaneously press and hold the Mute/Cancel push-button and the Manual Trigger push-button. Turn on the unit. A menu appears along the top of the LCD. Press corresponding push-button switches to make selections.

### **13.1 BACKLIGHT THRESHOLD**

13.1.1 Go into User Program Mode and go to Backlight Threshold menu.

13.1.2 Put finger about an inch away from backlight sensor and press the push-button over Save prompt. This will save the backlight threshold.

13.1.2.1 Pull finger away from the backlight sensor; the backlight should go out.

13.1.2.2 Fully cover the backlight sensor with finger; the backlight should go on.

13.1.3 Pull finger away from sensor and press push-button over Save prompt. This will save the backlight threshold.

### **13.2 CONTRAST THRESHOLD & TRIGGER LEVEL SENSITIVITY**

13.2.1 Go into User Program Mode and go to Contrast Threshold menu.

13.2.2 Press the push-button above the Down prompt until the contrast gets faint. Press the Save prompt. When the unit goes into operational mode, the contrast should be faint.

13.2.3 Go to Trigger Level Sensitivity menu before exiting User Program Mode. In the Trigger Level Sensitivity menu, press the Down prompt until the sensitivity level is 1.0 cmH<sub>2</sub>O.

13.2.4 Exit the User Program mode by pressing the Exit push-button. Do not turn off unit. Once in normal operating mode:

13.2.4.1 The contrast should be faint.

13.2.4.2 Use settings

13.2.4.2.1 Mode = A/C.

13.2.4.2.2 Rate = 6 BPM.

13.2.4.2.3 I time = 1.0 sec.

13.2.4.2.4 V<sub>t</sub> = 500 ml.

13.2.4.2.5 FIO<sub>2</sub> = 21%.

13.2.4.3 Use test lung.

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- 13.2.4.2.1 Pull up gently on test lung to simulate a patient's spontaneous breath. Verify the unit triggers an assisted breath every time the negative 1.0 cmH<sub>2</sub>O Trigger Level is reached.
- 13.2.5 Turn off unit. Go back into User Program Mode and go to Contrast Threshold menu.
- 13.2.6 At Contrast menu, press the Up prompt until the contrast is good; press the Save prompt. When units goes into operational mode, the contrast should be good.
- 13.2.7 Go to Trigger Level Sensitivity menu before exiting User Program Mode. In the Trigger Level Sensitivity menu, press the Up prompt and increase the Trigger Level to 5.0 cmH<sub>2</sub>O.
- 13.2.8 Exit the User Program mode by pressing the Exit push-button. Do not turn off unit. Once in normal operating mode:
- 13.2.8.1 The contrast should be good.
- 13.2.8.2 Use settings from 13.2.4.2
- 13.2.8.3 Use test lung.
- 13.2.8.3.1 Pull up on the test lung to simulate a patient's spontaneous breath. It should be more difficult to generate an assisted breath than when the Trigger Level was lower. Verify unit generates an assisted breath every time the negative 5.0 cmH<sub>2</sub>O Trigger Level is reached. Turning unit off resets Trigger Level Sensitivity back to its default value of 2.0 cmH<sub>2</sub>O.

**13.3 SPONTANEOUS FLOW**

- 13.3.1 Go into User Program Mode and go to Spontaneous Flow menu.
- 13.3.2 Press the Down prompt until the Spontaneous Flow reads 10 LPM. Exit the User Program mode. Do not turn off unit.
- 13.3.3 Go into SIMV mode.
- 13.3.3.1 Connect hose circuit to RT-200 (36).
- 13.3.3.2 Use 21% external air.
- 13.3.3.3 Disconnect green transducer line from patient valve. Cover up fitting hole and generate a negative pressure by gently pulling in on green transducer hose using a syringe. Either a demand breath or an assisted breath will be generated. The flow of the demand breath should be 10 LPM (+/- 10%).
- 13.3.4 Turning unit off resets Spontaneous Flow back to its default value of 60 LPM.

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**13.4 DEMO MODE**

13.4.1 Go into User Program Mode and go to Demo Mode menu.

13.4.2 Press the Set prompt, and exit the User Program mode. Do not turn off unit.

13.4.3 The unit is in Demo mode.

13.4.3.1 The mode should read "MODE=A/C DEMO."

13.4.3.2 Connect disposable patient circuit to test lung.

13.4.3.2.1 The exhaust valve and test lung should not inflate.

13.4.3.2.2 All the gas should flow out the exhaust port of patient valve.

13.4.3.2.3 A false airway pressure waveform should be generated in the Paw and bar graph LCD displays.

13.4.3.3 Disconnect patient circuit from test lung.

13.4.3.3.1 No Disconnect alarm should sound.

13.4.3.3.2 The false airway pressure waveforms should continue.

**14.0 BACKUP VENT****14.1 SETUP**

14.1.1 Use External Air.

14.2 In User Program mode go into Backup Vent menu. Press Test prompt.

14.2.1 Verify the unit goes immediately into testing Backup Vent and the following happens

14.2.1.1 LCD screen should blank

14.2.1.2 Alarm LED blinks

14.2.1.3 System Failure LED comes on solid

14.2.1.4 Audible alarm gives a repeating 4 to 5 pulse alarm.

14.2.2 Rate in Backup Ventilator

14.2.2.1 Connect hose circuit to RT-200 (45).

14.2.2.2 Rate should be 12 BPM +/- 10%.

14.2.3 I time in Backup Ventilator

14.2.3.1 Connect hose circuit to RT-200 (46).

14.2.3.2 I time should be 1.60 Sec +/- 10%.

14.2.4 Flow in Backup Ventilator

14.2.4.1 Connect hose circuit to RT-200 (36).

14.2.4.2 Flow should be 30 LPM or greater.

14.2.5 Pip Relief in Backup Ventilator

14.2.5.1 Connect hose circuit to test lung. Set compliance to .015 L/cmH<sub>2</sub>O. Resistance = 5.

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14.2.5.2 Using test lung pressure gauge, verify that Pip relief occurs at 40 cmH<sub>2</sub>O +/- 10%.

14.2.6 Manual Trigger in Backup Ventilator

14.2.6.1 Connect hose circuit to test lung. Set compliance to .015 L/cmH<sub>2</sub>O.

14.2.6.2 Press the Manual Trigger push-button.

14.2.6.2.1 Verify that gas flows as long as the push-button is held.

14.2.6.2.2 When the airway pressure reaches 40 cmH<sub>2</sub>O, the gas flow should stop.

## **15.0 POWER:**

### **15.1 BATTERY**

15.1.1 Measure battery voltage (Load). Value should be within range of 11.8V - 14.5V.

15.1.2 Low Battery Alarm

15.1.2.1 Setup. Disconnect external power and battery. Connect unit's battery connector cable to variable power source. Put voltage to 12 VDC and turn on unit.

15.1.2.2 Lower voltage until Low Battery Alarm occurs. This should occur within the voltage range of 11.1V - 11.7V.

15.1.2.2.1 AMC should show BATTERY LOW/FAIL alarm.

15.1.2.2.2 PIC Line 2 should show Battery Icon "LOW"

15.1.3 Battery Fail

15.1.3.1 Setup Same setup as 15.1.2.1.

15.1.3.2 Lower voltage until system shutdown occurs. This should occur within the voltage range of 8.5V - 9.3V.

15.1.3.2.1 Unit should shut down

15.1.3.2.2 System failure LED should come on continuously.

15.1.3.2.3 Audible alarm should come on continuously.

15.1.4 Charger Voltage

15.1.4.1 Disconnect battery connector cable from power source. Connect variable power source to unit's external power jack. Set voltage to 12 VDC.

15.1.4.2 Measure voltage at unit's battery connector cable. Value should be within range of 13.2V - 14.5V.

### **15.2 EXTERNAL POWER**

15.2.1 External Power Low



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- 15.2.1.1 Disconnect battery connector cable from power source. Connect variable power source to unit's external power jack. Set voltage to 12 VDC and turn on unit.
- 15.2.1.2 Lower voltage until External Power Low alarm occurs. This should occur within voltage range of 10.5V - 11.1V.
  - 15.2.1.2.1 AMC should show EXTERNAL POWER LOW alarm.
  - 15.2.1.2.2 PIC Line 1 should show "EXT PWR LOW"
- 15.2.1.3 Lower voltage until system shutdown occurs. This should occur within the voltage range of 9.05V - 9.85V.
  - 15.2.1.3.1 Unit should shut down
  - 15.2.1.3.2 System failure LED should come on
  - 15.2.1.3.3 Audible alarm should come on continuously.

**16.0 EEPROM:**

**Note:** Protection enabling is done during initial computer calibration. Verify this has been done by finding text file with corresponding serial number of unit.

**16.1 REAL TIME CLOCK RESET****16.1.1 Setup**

- 16.1.1.1 Connect RS232 to external power supply.
- 16.1.1.2 Connect external power supply to unit. Turn on unit.
- 16.1.1.3 Connect RT-200 to computer. Turn on RT-200 and computer.
- 16.1.1.4 Go into computer calibration program.

**16.1.2 To Reset Real Time Clock**

- 16.1.2.1 Press the F5 key to Hold unit.
- 16.1.2.2 Press the F3 key to reset Real Time Clock.
- 16.1.2.3 Press the F5 key to release the Hold.
- 16.1.2.4 Press the F10 key to exit calibration program.

**17.0 COSMETICS****17.1 Connector Panel Side**

- 17.1.1 Verify Exhalation valve hosebarb and Transducer hosebarb are tight.
- 17.1.2 Verify nuts to Oxygen and External air fittings are tight.
- 17.1.3 Verify Outlet Fitting is flush with connector panel and tight.
- 17.1.4 Cover and external power jack are properly positioned.

**17.2 Handle Side**

- 17.2.1 Verify handle is tight.

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- 17.2.2 Verify caution label is properly positioned.
- 17.2.3 Verify exhaust port nut is tight.
- 17.2.4 Verify three screws holding 22mm inlet port are tight.

**17.3 Back Side**

- 17.3.1 Verify six screws holding case together are in.
- 17.3.2 Verify three screws mounting compressor are in properly.
- 17.3.3 Condensed Operation Instructions should be mounted on back.
- 17.3.4 Verify serial number on label matches number on DHR

**17.4 Front Side**

- 17.4.1 Verify each knob is aligned properly, is tight, and has its respective cap.
- 17.4.2 Press each white pushbutton to verify operation.
- 17.4.3 Verify black switch guard around manual trigger button is tight.
- 17.4.4 Verify backlight sensor is properly in its window.
- 17.4.5 Verify three LEDs are properly in their windows.

**17.5 Battery Compartment Side**

- 17.5.1 Verify Filter pcb is soldered correctly to the Lemo connector.
- 17.5.2 Verify unit's battery connector is proper length.

**17.6 Shake Test/Cleaning**

- 17.6.1 Shake unit and listen for any loose parts.

**18.0 ACCESSORIES:****18.1 Check work order to determine required accessories.**

- 18.1.1 Check off Required boxes

**18.2 Gather required accessories and check off Supplied boxes.****18.3 EXTERNAL POWER SUPPLY**

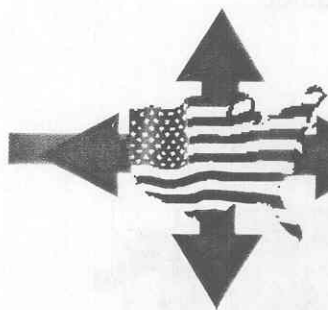
- 18.3.1 Verify external power supply's serial number.
- 18.3.2 Clean using a soft cloth or paper towel with Staticide.
- 18.3.3 Coil and rubber band the wires.

**19.0 TEST EQUIPMENT**

- 19.1 Record serial numbers of all test equipment used during test.

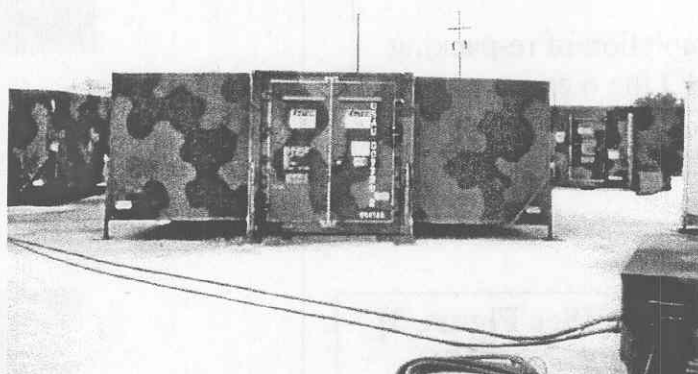
<input type="checkbox"/> 754 Input Test / <input type="checkbox"/> 754 Output Test		Serial #		Date / /		SMR#	
TIDAL VOLUME Vt must be within +/- 10% of Vt Set						Tested by III #:	
Vt Set	I Time	Rate	OXYGEN	EXT AIR	PUMP	Test Equipment	
200 ml (180-220)	0.4 Sec	50bpm	ml	ml	ml	RT-200	Test Lung
300 ml (270-330)	1.2 Sec	17bpm	ml	ml	ml	Multimeter	Stopwatch
500 ml (450-550)	0.5 Sec	40bpm	ml	ml	ml		
500 ml (450-550)	0.6 Sec	33bpm	ml	ml	ml	Air Regulator	
500 ml (450-550)	1.0 Sec	20bpm	ml	ml	ml		
500 ml (450-550)	1.5 Sec	13bpm	ml	ml	ml	Oxygen Regulator	
500 ml (450-550)	2.0 Sec	10bpm	ml	ml	ml		
750 ml (675-825)	1.0 Sec	20bpm	ml	ml	ml	Oxygen Analyzer	
1600 ml (1440-1760)	2.4 Sec	12bpm	ml	ml	ml		
3000 ml (2700-3300)	3.0 Sec	6bpm	ml	ml	ml		
FIO <sub>2</sub> Readings must be within +/- 10% of FIO <sub>2</sub> settings. I time = 1.0 sec. Vt = 500 ml	FIO <sub>2</sub> SET	O <sub>2</sub> & EXT AIR		O <sub>2</sub> & PUMP		PEEP: <input type="checkbox"/> Control <input type="checkbox"/> LCD Indicator <input type="checkbox"/> No Leak <input type="checkbox"/> Cough Protection <input type="checkbox"/> High Peep Alarm 4.0 cmH <sub>2</sub> O (2.5-5.5 cmH <sub>2</sub> O) _____ cmH <sub>2</sub> O 20.0 cmH <sub>2</sub> O (18.5-21.5 cmH <sub>2</sub> O) _____ cmH <sub>2</sub> O	
	21%	%		%			
	40%	%		%			
	60%	%		%			
	100%	%		%			
APNEA A/C, SIMV: Rate 12 BPM (10.8-13.2 BPM) _____ BPM; <input type="checkbox"/> Trigger (19 Sec-I time); <input type="checkbox"/> I Time & Vt (Unit Settings)							
APNEA CPAP: Trigger 10 Sec (9.0-11.0 Sec) _____ Sec; Pip Relief 40 cmH <sub>2</sub> O (36.0-44.0 cmH <sub>2</sub> O) _____ cmH <sub>2</sub> O; Rate 12 BPM (10.8-13.2 BPM) _____ BPM; I Time 1.67Sec(1.5-1.82Sec) _____ Sec; Flow 30 LPM (27.0-33.0 LPM) _____ LPM							
OPERATIONAL: <input type="checkbox"/> External Power; Charger Voltage (13.2-14.5) _____ V; <input type="checkbox"/> Batt; Battery Charger _____ mA; <input type="checkbox"/> Powerup Defaults A/C: <input type="checkbox"/> Control Breaths; <input type="checkbox"/> Assisted Breaths; <input type="checkbox"/> PV Mushroom Inflates/Deflates, No Retard							
SIMV: <input type="checkbox"/> Control Breaths; <input type="checkbox"/> Assisted Breaths; <input type="checkbox"/> Demand Breaths; Spontaneous Flow 60 LPM (54.0-66.0 LPM) _____ LPM							
CPAP: Spontaneous Flow 60LPM (54.0-66.0 LPM) _____ LPM; <input type="checkbox"/> Demand Breaths							
<b>CONTROLS /ALARMS / LCD INDICATORS:</b>							
EXTERNAL AIR:		<input type="checkbox"/> Control; <input type="checkbox"/> Low / Fail Alarm;		<input type="checkbox"/> LCD Indicator;		SIGH: <input type="checkbox"/> Control; <input type="checkbox"/> LCD Indicator	
PRESSURE PLATEAU:		<input type="checkbox"/> Control; <input type="checkbox"/> Plateau Volume Alarm;		<input type="checkbox"/> LCD Indicator			
HIGH PRESSURE:		<input type="checkbox"/> Control; <input type="checkbox"/> High Pressure Alarm;		<input type="checkbox"/> LCD Set point and Bar Graph Tic;		<input type="checkbox"/> Pressure Alarm Settings	
LOW PRESSURE:		<input type="checkbox"/> Control; <input type="checkbox"/> Low Pressure Alarm;		<input type="checkbox"/> LCD Set point and Bar Graph Tic;			
RATE:		<input type="checkbox"/> Control; <input type="checkbox"/> LCD Indicator; I TIME:		<input type="checkbox"/> Control; <input type="checkbox"/> 1:2 I:E Ratio Default;		<input type="checkbox"/> LCD Indicator	
Rate Settings: 15 BPM (13.5-16.5 BPM)		BPM; 60 BPM (54-66 BPM)		BPM; 150 BPM (135-165 BPM)		BPM	
I Time Settings: 0.50 Sec (0.45-0.55 Sec)		Sec; 2.00 Sec (1.80-2.20 Sec)		Sec; 3.00 Sec (2.70-3.30 Sec)		Sec	
TIDAL VOLUME:		<input type="checkbox"/> Control; <input type="checkbox"/> LCD Indicator;		AIR/OXYGEN MIXER:		<input type="checkbox"/> Control; <input type="checkbox"/> LCD Indicator	
MUTE/CANCEL:		<input type="checkbox"/> Control; <input type="checkbox"/> Mutes; <input type="checkbox"/> Cancels;		MANUAL BREATH:		<input type="checkbox"/> Control; <input type="checkbox"/> Audible Beep	
MODE:		<input type="checkbox"/> Control; <input type="checkbox"/> LCD Indicator;		<input type="checkbox"/> Calibration Abort Alarm;		<input type="checkbox"/> Unit Calibrates; Ver.1.85X: <input type="checkbox"/> Autocal works	
LCD VISUAL INDICATORS: <input type="checkbox"/> Vmin; <input type="checkbox"/> Inspiration/Exhalation; <input type="checkbox"/> Paw; <input type="checkbox"/> Power Info				LED INDICATORS: <input type="checkbox"/> Charge;			
Center; <input type="checkbox"/> Digital Bar Graph; <input type="checkbox"/> Peak Airway Pressure; <input type="checkbox"/> Mean Airway Pressure				<input type="checkbox"/> Alarm; <input type="checkbox"/> System Failure LED & Alarm			
ALARMS: <input type="checkbox"/> Disconnect; <input type="checkbox"/> O <sub>2</sub> Low/Fail; <input type="checkbox"/> FIO <sub>2</sub> ; <input type="checkbox"/> Vt Settings; <input type="checkbox"/> Vt; <input type="checkbox"/> I Time Truncated to 3-Sec; Ver.1.85X: <input type="checkbox"/> Total Flow Backup; <input type="checkbox"/> External Power Fail; <input type="checkbox"/> Inverse I:E; <input type="checkbox"/> Comp. NOTE: Cannot check: Extended Non-Use; Preventative Maintenance							
SAFETY SHUTDOWN: <input type="checkbox"/> 40 cmH <sub>2</sub> O / 4 Seconds; <input type="checkbox"/> Exhaust Valve Opens; <input type="checkbox"/> System Failure LED and Audible							
<input type="checkbox"/> Ver.1.83X Vent Failure Codes OR <input type="checkbox"/> Ver.1.85X:	NOTE: Cannot check: Code 5 (Memory Check)		<input type="checkbox"/> 1 (Transducer Cal Fail); <input type="checkbox"/> 2 (No Gas, Comp); <input type="checkbox"/> 3 (Total Flow Backup); <input type="checkbox"/> 4 (Excessive Airway Pressure); <input type="checkbox"/> 6 (Exhaust Valve Fail.); <input type="checkbox"/> 7 (Excessive Negative Pressure)				
	NOTE: Cannot check: Code 1 (Transducer Cal Fail), Code 3 (Excessive Airway Pressure), Code 4 (Memory Check), Code 7 (Run-Time Cal. Fail)		<input type="checkbox"/> 2 (No Gas, Comp); <input type="checkbox"/> 5 (Exhalation Valve Failure); <input type="checkbox"/> 6 (Excessive Negative Pressure)				
User Programs: <input type="checkbox"/> Backlight Threshold; <input type="checkbox"/> Contrast; <input type="checkbox"/> Trigger Level Sensitivity;				Battery; Lot # _____			
<input type="checkbox"/> Spontaneous Flow; <input type="checkbox"/> Demo Mode; <input type="checkbox"/> Real Time Clock Reading _____ Days, _____ Hrs;				RTC Battery _____ Volts			
<input type="checkbox"/> Software Version				Battery Age: _____ Months			
Backup Ventilator: <input type="checkbox"/> Alarm Led Blinks; System Failure LED Solid, Audible; Rate 12 BPM (10.8-13.2 BPM) _____ BPM; I Time 1.60 Sec (1.44-1.76 Sec) _____ Sec; Flow (>30.0 LPM) _____ LPM; <input type="checkbox"/> Pip Relief 40 cmH <sub>2</sub> O (36-44 cmH <sub>2</sub> O); <input type="checkbox"/> Man'l Trigger							
Battery: Voltage (11.8-14.5V) _____ V; Low Alarm (11.1-11.7V) _____ V; Low Batt. Shutdown (8.5-9.3V) _____ V							
External Power Low/Fail Alarm: Low Alarm (10.5-11.1V) _____ V; Fail Shutdown (9.05-9.85V) _____ V							
Cosmetics (N/A on Input Test): <input type="checkbox"/> Nuts & Screws Tightened; <input type="checkbox"/> Knobs Aligned & Tight;							III# _____
<input type="checkbox"/> Foam Blocks @ Battery Door; <input type="checkbox"/> Copper Tape; <input type="checkbox"/> Ground Strap Attached; <input type="checkbox"/> Input Power Inductor RTV'd							
EEPROM (N/A on Input Test): <input type="checkbox"/> Protection Enabled; <input type="checkbox"/> Real Time Clock Reset; * <input type="checkbox"/> T1 Saved; * <input type="checkbox"/> T2 Saved; * <input type="checkbox"/> Slope Calculated							
(* = <input type="checkbox"/> Ver1.85X N/A)							





# **INSTALLATION GUIDE FOR THE NARKOMED-M ANESTHESIA APPARATUS**

## **GUIDANCE FOR THE INSTALLATION INTO TWO-SIDED EXPANDABLE TACTICAL SHELTER**



**Step 1 (See Figure 1)**

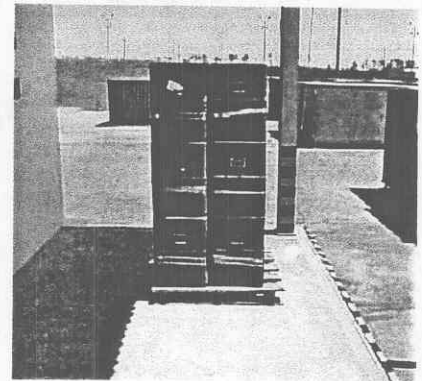
Upon complete installation of the Operating Table, Model 2080M Surgical Table and Restraint System installation of the NARKOMED-M Anesthesia Apparatus can begin.



**Figure 1**

**Step 2 (See Figure 2)  
Prepare to repack the OR ISO.**

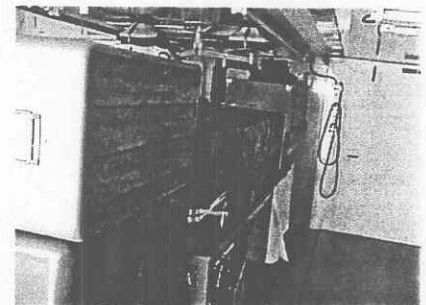
- a. Prior to repack remove from the unpacked items 6 each empty medical storage chests.
- b. Place the 6 empty Medical Storage chests to the side.
- c. Upon completion of re-packing the OR ISO the 6 empty Medical Chests will be placed in the OR MILVAN.



**Figure 2**

**Step 3 (See Figure 3)  
Began repack of the OR ISO**

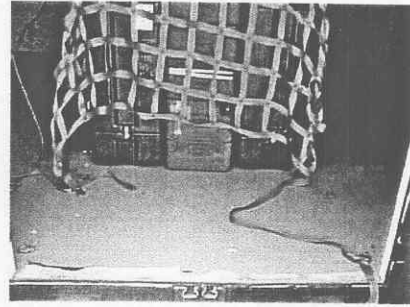
Repack the OR ISO filling the space completely around the new 2080M Operating Table moving from the personnel door end toward the cargo door end of the OR ISO



**Figure 3**

**Step 4 (See Figure 4)**  
**Placement of the**  
**NARKOMED-M in the**  
**OR ISO**

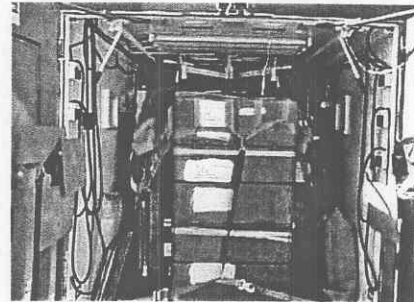
Packing from the Personnel door end toward the cargo door end leave space on the cargo door end to place the two NARKOMED-M containers.



**Figure 4**

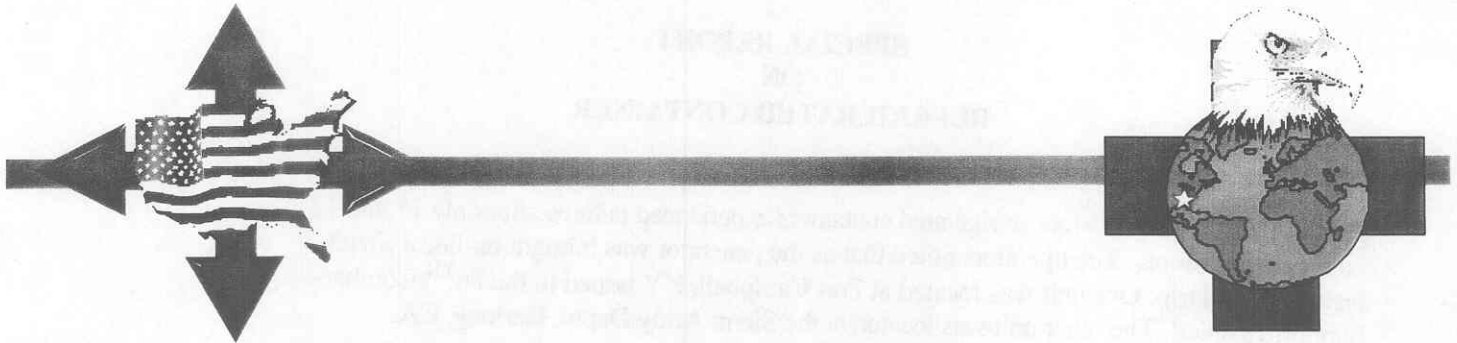
**Step 5 (See Figure 5)**  
**Secure the packing**

With the two NARKOMED-M hard containers in place secure the load with cargo netting.



**Figure 5**

**NOTE:** The six empty medical chests will be placed into the OR MILVAN upon completion of the NARKOMED-M Anesthesia Apparatus into the OR ISO.



**CONTAINER, REFRIGERATED  
20 FEET  
NSN: 8145-01-388-4966  
MODEL: KR020A180G**

**SPECIAL REPORT**

**MAINTENANCE PROBLEM  
&  
RESOLUTION**

**Prepared For:**

**U.S. Army Medical Materiel Agency  
ATTN: MCMR-MMR-M  
1423 Sultan Drive, Suite 100  
Fort Detrick, Maryland, 21702-5001**

**Prepared By:**

**Mr. Chuck Davis  
Decisions and Advanced Technology Associates, Inc.  
44 Portwest Court  
St. Charles, Missouri 63303**



## SPECIAL REPORT ON REFRIGERATED CONTAINER

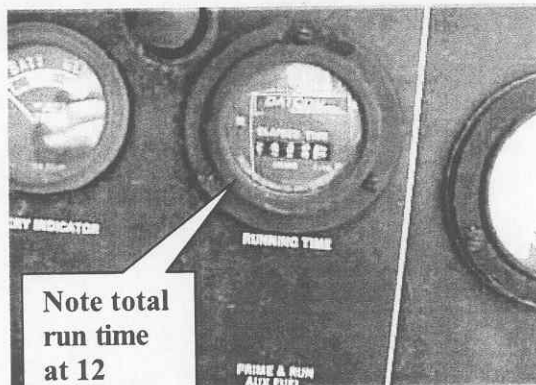
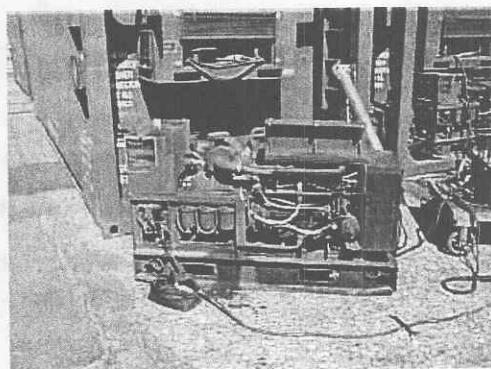
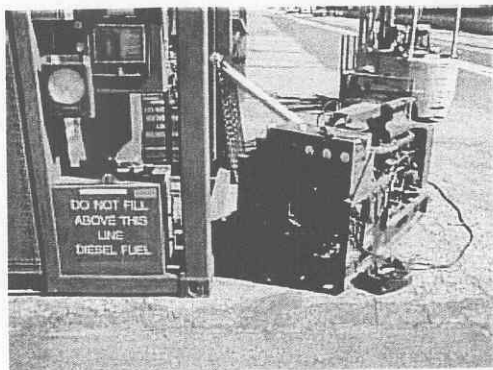
**Situation** Two 20-foot refrigerated containers experienced failures after only 11 and 12 hours of operations. The operators noted that as the generator was brought on-line a circuit breaker would trip. One unit was located at Fort Campbell, KY issued to the 86<sup>TH</sup> Combat Support Hospital. The other unit was located at the Sierra Army Depot, Herlong, CA.

**Container Description**

Part Number: 288-1  
Serial Number: 945095  
USAH007693-8  
Manufacture Date: 9/96

**Generator Description**

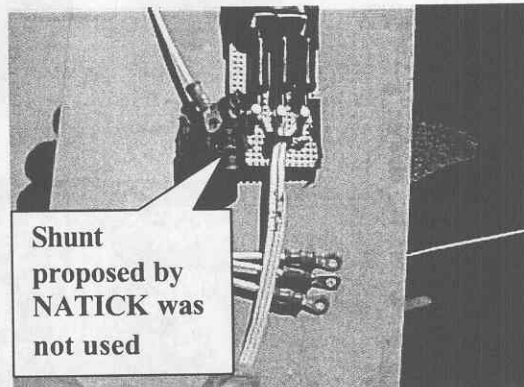
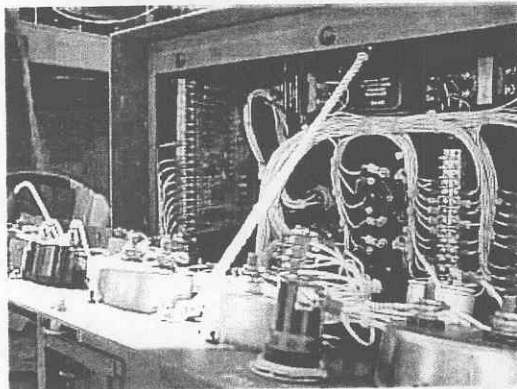
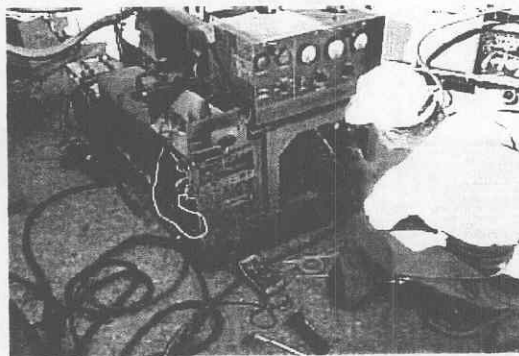
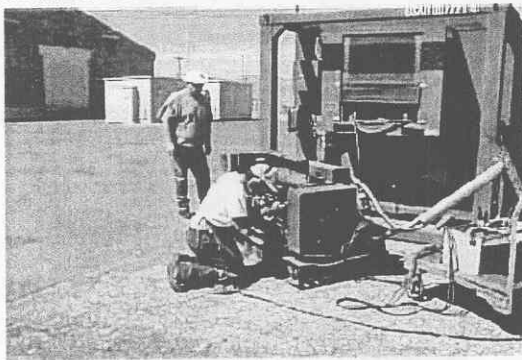
Generator, 10 KW  
NSN: 6115-00-465-1030  
Serial Number: RZ85246  
120V Single Phase  
240V Single Phase  
208V Three Phase  
AMPS: 104.52  
Date of Manufacture: 3/83  
Manufacture: Libby Welding Co. Inc.  
Contract Number: DAAJ09-83-C-8827



**Resolution of the Problem**

**Personnel Involved** Depot personnel who performed the troubleshooting procedures are Mr. Tom Byers and Mr. Nick Dolphay. Mr. Jerry Washburn, DATA, Inc. MFR, provided data collection services and Mr. Chuck Davis DATA Inc..

**Troubleshooting Procedures** Troubleshooting procedures included a trace-out of the wiring harness looking for worn, chaffed and shorted wires. None were found. Components were exchanged attempting to find the inoperative element. Control panel components were tested and found to be okay. When the circuit breaker was exchanged the problem was resolved. Natick equipment specialist suggested that a shunt should be installed in the circuit, but after testing the generator with the new circuit breaker installed, Sierra depot and USAMMA personnel concurred that the shunt is not required.



**Testing** After the circuit breaker was replaced the generator and refrigeration unit was operated for 38-hours without a failure. During this time the units were turned on and off a total of 44 times. The tests were conducted at various time intervals and different ambient temperatures.

<u>DATE</u>	<u>NO. OF STARTS</u>	<u>DATE</u>	<u>NO. OF STARTS</u>	<u>DATE</u>	<u>NO. OF STARTS</u>
2 Aug	7	7 Oct	4	18 Oct	5
3 Aug	7	12 Oct	4	19 Oct	4
4 Oct	4	13 Oct	4	26 Oct	3
5 Oct	4	4 Oct	3	1 Dec	5



Each time the temperature in the container was lowered to 15 degrees Fahrenheit and maintained.

**Refrigeration Unit Description**

NSN: 4110-01-394-6473

Part Number: 94833 assy152k0000-3

Serial Number: 952862

Model: F 9000RE-3

**Failed Component**

The failed circuit breaker is described as follows:

Manufactured by: Heinemann Electric Company

Catalog Number: CD3-2142-1

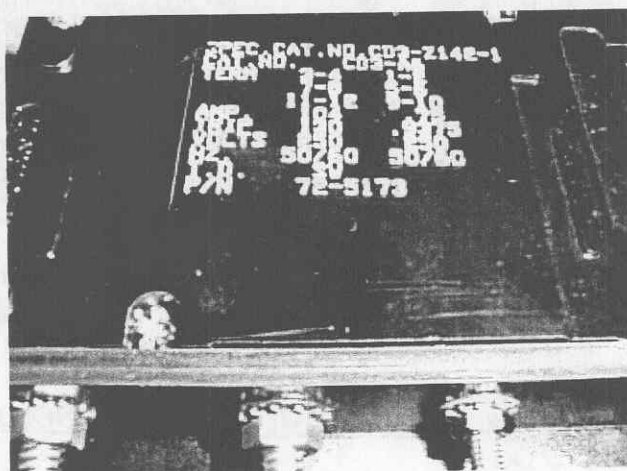
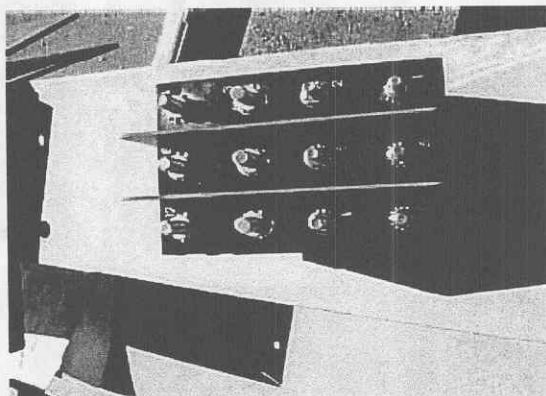
Amps: 0.75

Volts: 250

Hertz: 50/60

TD

Part Number: 72-5173



**New Circuit Breaker**

Manufacturer: Heinemann Electric Company

Spec. Cat. Number: CD3-2142-1

Cat Number: CD3-A6

Amps: 104 .75

AC Trip: 130 .9375

Volts: 250

Hertz: 50/60

T.D. SW

Part Number: 72-5173

CD: 9229

QCE/M: 7108

Term: 3-4 / 1-2 7-8 / 5-6 11-12 / 9-10

The 86<sup>th</sup> Combat Support Hospital personnel experienced the same failure of the circuit breaker during acceptance inspection after being issued the container during USAMMA sustainment equipment exchange that took place during the week of 6 – 10 September 1999. Mr. Davis contacted Sierra Army Depot requesting they send, via FEDEX, the new type circuit breaker for installation by the 86<sup>th</sup> CSH maintenance personnel. The circuit breaker resolved the problem and the 86<sup>th</sup> CSH maintenance personnel have monitored the generator during Preventative Maintenance Checks and Services each week since the new circuit breaker was installed. There have been no failures.

**Management Data Response for NSN 5925-01-050-0484****Item Name: CIRCUIT BREAKER**

PMI: U ADP: CC: N DML: A ESDC: HMIC: P ENAC:

S/A	SOS	AAC	QUP	UI	Unit Price	SLC	CIIC	RC	MGMT CTL	USC
PC	Phrase	Statement				UI	Conv	Factor	OOU JTC	
DS	S9E	D	1	EA	86.27	0	U		-----	I
DA	S9E	D	1	EA	86.27	0	U	Z	Q22VRX-	A
GP	S9E	D	1	EA	86.27	0	U		-----	C
DF	S9E	D	1	EA	86.27	0	U	N	SF9---N	F
DM	S9E	D	1	EA	86.27	0	U	Z	15E2B--	M
DN	S9E	D	1	EA	86.27	0	U		9N-----	N

**Reference Number Data Response for NSN 5925-01-050-0484****Item Name: CIRCUIT BREAKER**

TYPE II: 4 INC: 00136 HCC:

	I	D
	S	RN RN A RN
Part Number	CAGE	C CC VC C AAC
		SADC



CD3Z142-1	74193 5 3 2 5 CT
320-0462	44940 5 5 2 5 CT
72-5173	30554 5 1 2 1 CT

**Supplier Data Response for NSN 5925-01-050-0484****Item Name: CIRCUIT BREAKER**
**CAGE Code: 30554      Status: A      Type: A      CAO: S2404A      ADP: SC1020**
**Company Name and Address:**

DEPARTMENT OF DEFENSE PROJECT MANAGER-MOBILE ELECTRIC POWER

7798 CISSNA RD SUITE 200

SPRINGFIELD VA 22150-3199

UNITED STATES

Phone: 703-806-7219

FAX: 703-806-7004

RPLM Code:

ASSOC Code:

AFFIL Code:

SIZE: N

Primary Business: N

Type of Business: N

Women Owned: N

SIC Codes:

**Supplier Data Response for NSN 5925-01-050-0484****Item Name: CIRCUIT BREAKER**
**CAGE Code: 44940      Status: A      Type: A      CAO: S2401A      ADP: SC1002**
**Company Name and Address:**

ONAN CORP SUB OF CUMMINS ENGINE CO INC

1400 73RD AVE NE

MINNEAPOLIS MN 55432-3299

UNITED STATES

Phone: 612-574-5912

FAX:

FORMERLY ONAN CORP U S POWER PRODUCTS DIV SUB OF MCGRAW-EDISON CO

RPLM Code:

ASSOC Code: 15434

AFFIL Code: S

SIZE: E

Primary Business: J

Type of Business: N

Women Owned: N

SIC Codes:

**THIS IS THE CORRECT CIRCUIT BREAKER TO ORDER****Supplier Data Response for NSN 5925-01-050-0484****Item Name: CIRCUIT BREAKER**
**CAGE Code: 74193      Status: A      Type: A      CAO: S2101A      ADP: S3910A**
**Company Name and Address:**

EATON CORP HEINEMANN PRODUCTS

COMMERCIAL CONTROLS DIV

2300 NORTHWOOD DR

SALISBURY MD 21801

UNITED STATES

Phone: 410-546-9778

FAX: 410-546-9676

FORMERLY HEINEMANN ELECTRIC CO LAWRENCEVILLE NJ

RPLM Code:

ASSOC Code: 81118

AFFIL Code: A

SIZE: B

Primary Business: J

Type of Business: N

(continued) Appendix F. Refrigerated Container Maintenance Problem and Resolution

Women Owned: N

SIC Codes:

**Characteristics Data Response for NSN 5925-01-050-0484**  
**Item Name: CIRCUIT BREAKER**

MRC	Requirement Statement	Clear Text Reply
<b>NAME</b>	<b>ITEM NAME</b>	<b>CIRCUIT BREAKER</b>
<b>AKPX</b>	<b>POLE QUANTITY</b>	<b>12</b>

**Recommendations** Recommend the findings of this test be passed on to the Item Manager and all units that are issued the Refrigerated Container,  
 Model KR020A180G  
 NSN: 8145-01-388-4966

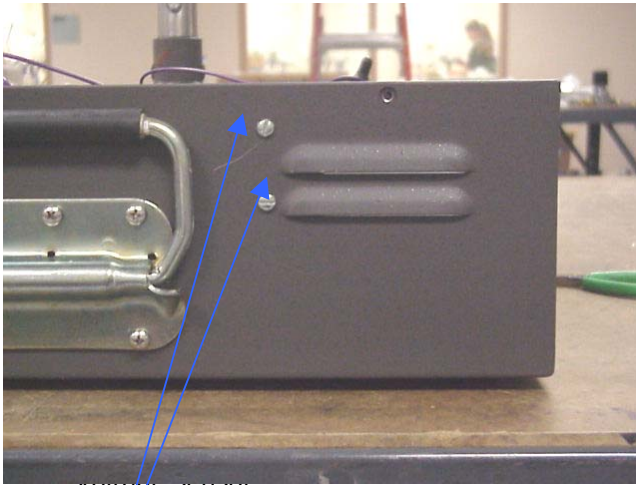
Further recommend the United States Army Medical Materiel Agency (USAMMA) contact the responsible agency to correct the information in FEDLOG so the correct circuit breaker will be issued to units when this item is placed on order.

Both the old and new circuit breaker has the same part number and are listed by the same National Stock Number NSN: 5925-01-050-0484, however, the trip ratings are not the same as listed on the printed information on the circuit breakers. When ordering the correct circuit breaker, NSN: 5925-01-050-0484 make sure the correct CAGE code: **74193** is used.

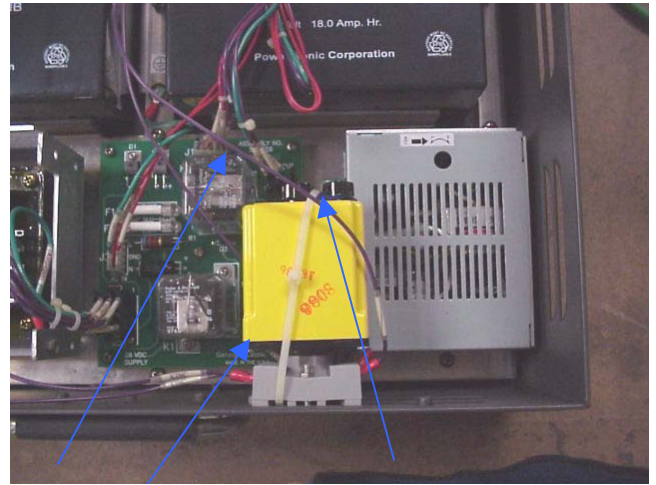
**Acknowledgement** Once again the Sierra Army Depot personnel were very cooperative and excellent to work with in this effort to provide the best equipment to the Care Provider  
**—The Soldier.**

**Point of Contact** The USAMMA POC:  
 Mr. Chuck Davis, DSN 343-4465 or Comm. (301) 619-4465

# Appendix G. Voltage Sensor Installation



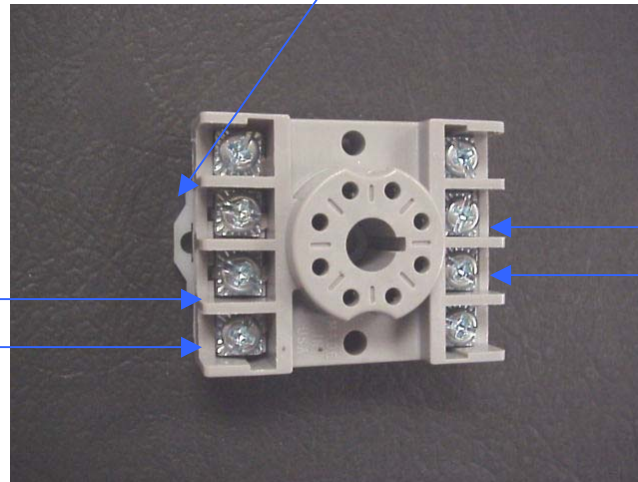
Mounting screws



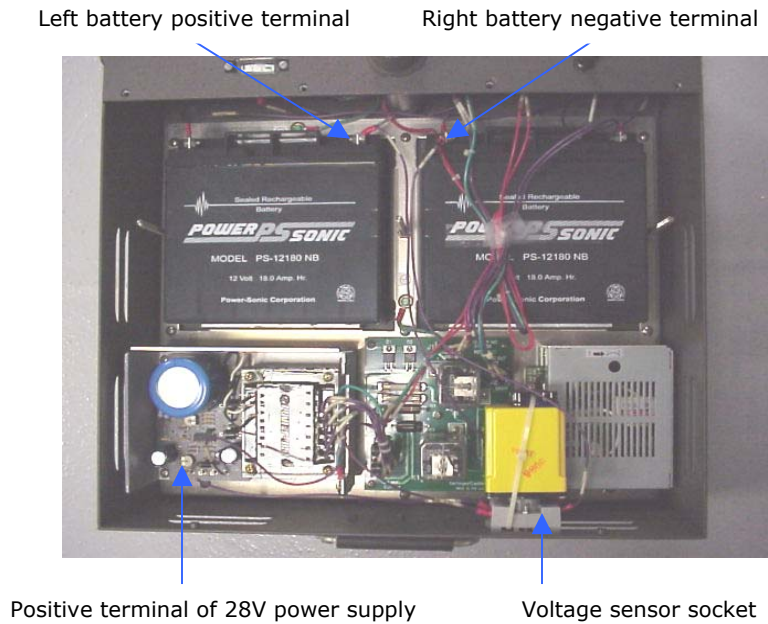
Ensure voltage sensor clears K-2 relay on relay PC board

Relationship of tab on left side

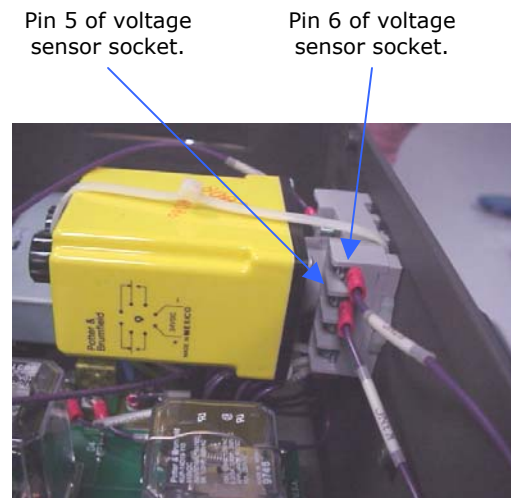
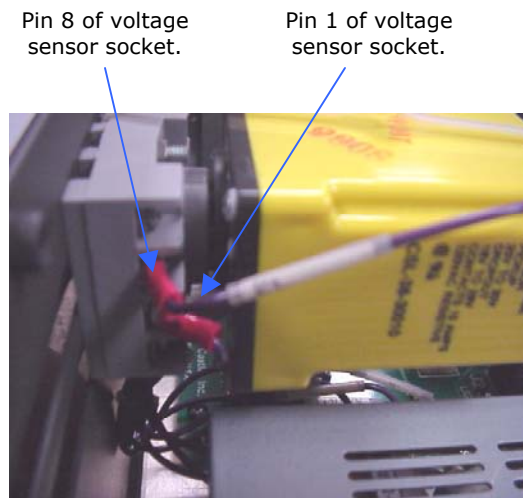
Pin 5  
Pin 6



Pin1  
Pin 8



1. Unsolder wire from positive terminal of 28V power supply.
2. Connect to pin 5 of voltage sensor socket.
3. Connect new wire from positive terminal of 28V power supply to pin 6 of voltage sensor socket.
4. Connect new wire from negative terminal of right battery to pin 8 of voltage sensor socket.
5. Connect new wire from positive terminal of left battery to pin 1 of voltage sensor socket.



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**SB 8-75-S6**

By Order of the Secretary of the Army:  
ERIC K. SHINSEKI  
*General, United States Army*  
*Chief of Staff*

Official:

  
JOEL B. HUDSON  
*Administrative Assistant to the*  
*Secretary of the Army*

Distribution:

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